

THESE SPECIFICATIONS HAVE BEEN REVISED FOR SOLICITATION
[REV AUG 1999]

TECHNICAL PROVISIONS

TAXIWAY "H" LIGHTING SYSTEM

PROJECT NO. 99-0089

AT

DYESS AIR FORCE BASE, TEXAS

FOR

DEPARTMENT OF THE AIR FORCE

HQ 7TH WING



PROJECT MANAGER:_____ DATE:_____

MURRAY J. BOUQUET

CONTRACTING OFFICER:_____ DATE:_____

RONALD G. MILLER

TECHNICAL PROVISIONS
TABLE OF CONTENTS

DIVISION 1 - GENERAL

1A	General
1B	Utilities (Contractor Identified)
1C	Environmental Protection
1D	Dyess AFB - Flightline Rules

DIVISION 2 - SITE WORK

2A	Demolition
2B	Excavation, Trenching, and Backfilling for Utilities Systems
2C	Storm Drainage System
2D	Runway Paint Removal
2E	Pavement Markings

DIVISION 3 - CONCRETE

3A	Concrete for Building Construction (Minor Requirements)
----	---

DIVISION 9 - FINISHES

9A	Painting, General
----	-------------------

DIVISION 15 - MECHANICAL

15A	Ventilating Control Systems
----------------	--

DIVISION 16 - ELECTRICAL

16A	Electrical Distribution System, Underground
16B	Electrical Work, Interior
16C	Airfield Lighting and Visual Navigation Aids
16D	Fiber Optics Data Transmission Media for Airfield Lighting Controls

TECHNICAL PROVISIONS

SECTION 1A- GENERAL

1. SCOPE: The work covered by this project consists of the Contractor furnishing all layout, survey, plant, labor, supervision, quality control, materials, equipment, machines, tools, appliances, services, supplies, and incidentals and of performing all operations in connection with the construction of ~~REPAIR MAIN RUNWAY LIGHTING AND ADD TAXIWAY~~ "H" Lighting System, Dyess AFB, Texas, complete and in strict accordance with the plans and specifications.

~~Repair work as indicated by Item No. 1, 2, & 3 on the bid schedule shall include, but not be limited to, the following:~~

~~Replacement of runway edge lighting fixtures, conductors, and isolation transformers; replacement of distance markers; replacement of wind cones; installation of fiber optic control system and related duct lines; replacement of electrical service and distribution equipment in the Assault Strip Lighting Vault and replacement of constant current regulators in the vault; repair of Taxiway H storm drainage system~~

Minor construction work as indicated by Item Nos ~~2, 4, 5, & 6~~ 1, 2, & 3 on the bid schedule shall include, but not be limited to, the following:

Installation of a taxiway edge lighting system for Taxiway H, including edge lighting fixtures, isolation transformers, conductors, duct lines, constant current regulator, guidance signs and related appurtenances. ~~Addition of Taxiway "H" storm drainage system.~~

2. WORKING CONDITIONS

2.1 Phasing/Sequence of Construction Requirements:

- A. The major items of work of this project occur in three distinct areas as hereinafter described.

~~1. Area "A" Main Runway (1634):~~

- ~~• Replace existing runway edge lights and cable.~~
- ~~• Replace existing "distance remaining" signs.~~
- ~~• Replace existing nonlighted wind socks with lighted windsocks.~~

2. Area "B" - Taxiway "H":

- Install taxiway edge lights along the eastwest portion of Taxiway "H".
- Provide related work including duct lines, pull boxes, jacking, and boring and series lighting cable ~~for fiber optics lighting control cable and for a new restricted area stop light.~~
- Install taxiway edge lights on the remainder of Taxiway "H" which is on the old Army Airfield concrete apron. Provide related work including duct lines **and** pull boxes jacking and boring, saw cutting, and series lighting cable. ~~in the ductbank paralling Taxiway "H" for future Taxiway "H" lighting system.~~
- Install taxiway guidance signs.
- ~~Install storm water inlet structures on the wet side of Taxiway "H" (on concrete apron). Provide related work including, saw cutting, jacking and boring, concrete manholes, storm drain piping and connections to existing inlet structures~~

3. Area "C" - Assault Vault and Assault Control Tower:

- ~~• Provide new outdoor pad mounted transformer and remove existing floor mounted pole type transformer from inside vault.~~
- ~~• Remove existing panelboard, disconnects, drytype transformer, wireways, conduits, conductors, and lighting fixtures from vault.~~
- ~~• Install new main panelboard, drytype transformer, conduits, conductors, and lighting fixtures in vault.~~
- ~~• Replace existing constant current regulators (2) serving the Taxiway "J" edge lights and the regulator serving the "Drop Zone" lighting~~
- Add a new constant current regulator to serve the new Taxiway "H" edge lights.

- ~~• Remove the existing airfield lighting control panel controlling the Assault Landing Strip runway lights, the Taxiway "J" edge lights and the Drop Zone lights.~~

-
- ~~• Provide a new airfield lighting control panel which will control the above lighting systems and will also control the existing Drop Zone Stop Light and the new Taxiway "J" lighting system. A second lighting control panel shall be provided in the Main Control Tower and the two panels shall be interconnected by a fiber optic cable link~~

- B. Interruptions: Interruptions to airfield lighting systems, taxiways or runways shall be as set out in the "Work Plan" submitted by the Contractor and approved by the Contracting Officer. Refer to SECTION 1D DYESS AFB FLIGHTLINE RULES.

Existing airfield lighting systems shall remain in operating condition except for minimum interruptions, as set out in the "Work Plan" submitted by the Contractor and approved by the Contracting Officer. Prior to each interruption, all necessary materials and a sufficient labor force shall be assembled to permit completing the work within the scheduled time interval. Under no circumstances shall any of the existing airfield lighting circuits be left inoperative without making provisions for suitable temporary connections in the affected area or areas. All airfield lighting circuits covered under this Contractor shall be restored in such a manner that they will be operational at dusk each day. The Contractor shall include in his "Work Plan" a schedule for outages and provision for maintaining lighting and lighting control.

- C. Phasing/Sequence of Construction: ~~The All work in Areas "A" (Main Runway) and "B" (Taxiway "H") may be conducted concurrently if scheduled in the "Work Plan" submitted by the Contractor and approved by the Contracting Officer. The work in Area "C" shall be performed after the work in Area "A" is substantially complete and when the work in Area "B" is completed the point of being ready to be served by the new work to be provided in Area "C".~~

~~Specific requirements related to work of this project are as follows:~~

~~1. Main Runway (16-34) Area:~~

-
- ~~a. The new "distance remaining" signs are to be installed at the locations of the existing signs. Corresponding signs on opposite sides of the runway shall not be removed or rendered inoperative at the same time. Sequential signs on the same side of the runway shall not be removed or rendered inoperative at the same time.~~

~~b. For each windcone location, the new lighted wind cone shall be in place and fully operational before the existing windcone is removed.~~

~~2. Assault Vault and Assault Control Tower: Replacement of electrical equipment in the Vault as indicated will require a complete interruption of electrical service to the Vault. The removal of the existing equipment and the installation of the new equipment shall be scheduled to take place over a nine (9) day period which shall include two consecutive weekends and the week in between.~~

2.2 Work Area Availability:

The work areas for all airfield/flightline work will be available to the Contractor at such times as are set out in the "Work Plan" submitted by the Contractor and approved by the Contracting Officer. Refer to SECTION 1D DYESS AFB- FLIGHTLINE RULES.

The Contractor may work near the main runway Area "A" during normal work hours as defined in Paragraph 3. WORK SCHEDULE. When working near the main runway, the Contractor shall:

- A. Remain in radio contact with the Control Tower at all times.
- B. Be in close communication with all Contractor personnel working near the main runway.
- C. Be prepared to move all personnel and equipment away from the main runway in the event of an InFlight Emergency (IFE).

The Contractor may perform work in Area "B" during normal working hours. However, this area is within the Drop Zone exercise area. Anytime that the Contractor is working in this area and a "drop zone" exercise is to be conducted, he shall be required to clear the area within five minutes after being notified by the Control Tower or the Contracting Officers representative. The Contractor may conduct his work in this area on weekends if he so opts.

Availability of said area will start when the last plane has landed on Friday evening and will last until 6:00 a.m. on the following Monday morning. In the event of a "Higher Headquarters Directed Mission" during the weekend, said area will not be available to the Contractor for the duration of said "Mission".

2.3 Joint Occupancy:

The airfield and flightline will remain active and operational during the work of this project. DAFB personnel and equipment shall have full access to all areas of the airfield and flightline at all times.

2.4 Scheduling:

Scheduling of the work shall be as set out in the "Work Plan" submitted by the Contractor and approved by the Contracting Officer. Refer to SECTION 1D DYESS AFB- FLIGHTLINE RULES.

2.5 Down Time:

Down time is the period that the Government ~~tops~~ stops the Contractor from working because the Government needs sole access to the facility (runway, taxiway, etc.). Refer to Section SPECIAL CLAUSES and to Bid Schedule for additional information.

2.6 Aircraft Traffic or Other Interruptions:

Refer to SECTION 1D DYESS AFB- FLIGHTLINE RULES.

2.7 Required Notice Requirements:

Refer to SECTION 1D DYESS AFB- FLIGHTLINE RULES.

2.8 Requirements for Contractor Employees to Enter Secured Work Areas:

Refer to Paragraph 12 SECURITY REQUIREMENTS of this Section 1A specification.

2.9 Temporary Heating/Cooling:

There will be no requirement for temporary heating/cooling.

2.10 Required Work Plan:

The Contractor will be required to prepare a work plan and submit said plan to the Contracting Officer for approval. Refer to Paragraph No. 1 of SECTION 1D DYESS AFB- FLIGHTLINE RULES.

3. WORK SCHEDULE:

Working hours for the Contractor will normally be between the hours of 7:30 a.m. and 4:30 p.m. excluding Saturdays, Sundays, and Federal holidays. If the Contractor desires to work during periods other than above, additional government inspection forces may be required. The Contractor must make his/her request to the Contracting Officer five (5) calendar days in advance of his/her intention to work during other periods to allow assignment of additional inspection forces. If such force is reasonably available, the Contracting Officer may authorize the Contractor to perform work during periods other than normal duty hours/days.

4. SAFETY AND HEALTH

- 4.1 All Contractor operations shall be conducted and performed in accordance with Department of Labor, OSHA requirements found in 29 CFR 1910 and 29 CFR 1926, project identified national standards, military manuals, instructions, pamphlets, standards and handbooks and with the Corps of Engineers (COE) Safety Manual 3851-1 dated 03 Sep 96.
- 4.2 All companies who conduct business within the state of Texas must, in accordance with Texas Workman Compensation laws (Texas House Bill 62), have an approved company safety policy and an Accident Prevention Plan. The plan, approved by the Texas Workman Compensation Commission (TWCC), shall be submitted For Information Only (FIO) in accordance with paragraph SUBMITTAL REQUIREMENTS. In addition to meeting the TWCC requirements; the plan must also include the requirements of COE Safety Manual 385-1-1.
- 4.3 All holes/pits/trenches/manway openings, etc, that are to be left open shall be surrounded with a 48 inch high mesh fence with highly visible orange plastic coating. The fence shall be securely anchored with tension wires and posts as required to prevent sagging and located a minimum of 3 feet from the opening so as to prevent an individual, should they fall across the fencing, from falling into the opening. Holes shall also be covered, when not being worked in, with three quarter inch plywood or a metal grating that will prevent small children from entering the hole.
- 4.4 Radiation Permits and Authorizations: Contractors contemplating the use of devices containing radioactive materials (i.e., soil moisture/density probes) or nonionizing radiation producing equipment (radio frequency radiation emitters or lasers) while performing work on this contract must obtain written authorization/permit from the Dyess AFB Radiation Safety Officer (RSO). To obtain the required authorization permit, contact the RSO at 7 ADOS/ SGPB, 697 Hospital Road, Dyess AFB, TX 79607-1367 (this is mailing address, physical address is 880 Third St.) or (915)6962325/3289. A 45-day lead time should be anticipated. Without the proper authorization, Contractors will not be allowed to bring these devices on base.

4.5 Confined Space Entry, in accordance with OSHA 29 CFR 1910.146 and AFOSH Standard 91-25, applies to this project.

5. DISPOSITION OF WASTE AND EXCESS MATERIALS

5.1 The Contractor shall make waste ~~determinations~~ for all wastes generated in the performance of this contract, in accordance with the provisions set out in 40 Code of Federal Register (CFR) Part 261, at the time and point of generation. The Contractor shall properly sample, analyze, or by use of process knowledge classify all wastes in accordance with Title 30 Texas Administrative Code (TAC), Chapter 335, Subchapter R at no additional cost to the Government. Unless it is positively known by the Contractor that a waste is non-hazardous, the Contractor shall manage the waste as a hazardous waste until sample test results prove otherwise. All non-hazardous wastes, special wastes, and hazardous wastes (including but not limited to construction debris, material containers, material residues and unwanted excess materials) resulting from the performance of work under this contract shall be removed from and disposed of off Dyess AFB by the Contractor at no additional cost to the Government and in accordance with all applicable Federal, State, and local laws, rules and regulations. Under no circumstances shall the Contractor dispose of wastes or excess material in trash dumpsters, storm sewers, sanitary sewers, creeks, streams or other property of Dyess AFB. The Contractor and the Government will be co-generators of all wastes resulting from the performance of this contract. Contractor's attention is directed to Section 1C-Environmental Protection, the paragraph Disposal of Wastes, for special requirements on disposal of waste types.

5.2 Dumping/cleaning out of concrete trucks on Dyess AFB is prohibited. Concrete truck chutes only may be rinsed at the construction site. Wastewater and concrete from this rinse shall be collected in a high density polyethylene (HDPE) plastic lined box or pit provided by the Contractor at the site. At the end of pouring operations, the Contractor shall excavate all the waste and liner and properly dispose of same. The pit shall be completely backfilled and the site restored to original conditions.

6.3 All equipment and materials to be removed from the project site not specifically identified for turn-in to the Government shall become the property of the Contractor. The Contractor shall turn-in all materials specifically designated for turn-in to the Government to a location at Dyess AFB, as designated by the Contracting Officer. The Contractor shall obtain a receipt from the government employee responsible for receiving the returned equipment or material as evidence of compliance. A copy of the receipt(s) shall be submitted to the Contracting Officer prior to final inspection of the project. Following is a list of equipment or materials to be turned in:

A. ~~25KVA, pole type, oil insulated transformer (Assault Lighting Vault)~~

~~B. Transmitter, Electric Time System (Assault Lighting, Vault)~~

6. STORAGE AREA (I.E. TEMPORARY FIELD OFFICE, STAGING AREAS, TOOL/JOB SHACKS, AND OTHER CONSTRUCTION FACILITIES):

There are no Government furnished covered or secure storage areas. Limited onbase, off site storage will be permitted on a space available basis. The location on Dyess AFB of the Contractor's temporary field office, storage, and other construction buildings required temporarily in the performance of the work, shall require written approval of the Contracting Officer. Plans showing temporary field office, storage, and other construction buildings shall be submitted for approval (GA) of the Contracting Officer. Utilities at the storage area may or may not be available for Contractor use. The Government implies no responsibility for lost or stolen materials, equipment or tools, the security of which lies solely with the Contractor. Contractor shall keep his storage areas clean, neat and orderly and will keep grass mowed to a maximum height of 4 inches. Temporary fencing used by the Contractor to delineate constructor sites shall be securely anchored with tension wires and posts as required to prevent sagging and an unsightly appearance. Fencing shall be maintained by the Contractor in this manner throughout the life of the contract. Due to high winds in west Texas, Contractor shall take every precaution to preclude trash from blowing off site.

7. TOILET FACILITIES

There are no toilet facilities available for Contractor use. Contractor shall provide his own portable/temporary toilet facilities.

8. CLEAN-UP: The Contractor shall at all times keep the construction site and storage area(s) free from accumulation of waste, rubbish, or construction debris. All loose or light weight materials shall be secured to prevent blowing or scattering. The burning of trash or construction debris is strictly prohibited on Dyess AFB. Prior to final inspection, the Contractor shall remove all construction debris, tools, equipment, and materials not the property of the Government. Upon completion of the work, the Contractor shall leave the work site and storage area(s) in a clean, neat and workmanlike condition satisfactory to the Contracting Officer. Contractor's attention is directed to Section 1C - Environmental Protection, the paragraph PostConstruction Cleanup or Obliteration.

9. FINAL INSPECTION:

The Contractor shall advise the Contracting Officer of the Contractor's desired final inspection date seven (7) calendar days in advance of that desired date to permit proper coordination. The date selected shall provide adequate time for Contractor performed corrections of final inspection deficiencies within the contract performance time. The Contracting Officer will be the final authority for determining whether or not the Contractor's performance is sufficiently advanced to warrant a final inspection.

10. TESTING

Costs of all tests, unless specifically indicated as being performed by the Government, will be at the Contractor's expense. It is the responsibility of the Contractor to schedule all tests and to notify the Contracting Officer or his representative in a timely manner prior to any required testing. All test results shall be submitted to the Contracting Officer on AF Form 3000, Material Approval Submittal.

11. AS-BUILT DRAWINGS:

The Contractor shall maintain one set of project drawings for "as-built" notations and marking. The Contractor shall update these plans to indicate "as-built" construction and shall submit them to the Contracting Officer prior to final inspection under the cover of an AF Form 3000. Updated notations and markings shall be neat, clear, and legible in all respects.

11.1 INSTRUCTION MANUALS:

Required instruction manual(s) shall be provided in three ring binder(s) with tabs and an index/table of contents. Provide permanent label on front and side with project title, project number, facility number, street address, Contractor/ Subcontractor name, address, phone number(s), and manual title/contents description. Include all wiring diagrams and parts lists.

12. SECURITY REQUIREMENTS:

Dyess AFB security instructions are outlined in a brochure (with appendixes) entitled Local Security Policy and Security Support Agreement (LSPSSA) with Dyess Air Force Base prepared by the 7th Security Forces Squadron. This brochure with its appendixes, may be obtained from the bid document source. This brochure and its appendixes provide a good explanation of Dyess AFB security requirements. These security requirements are incorporated into this contract.

Dyess AFB security may be viewed as being one of three broad levels, the level in effect being dependent on the location or area of Dyess AFB in question.

- a. The lowest level of security exists in general access areas. These areas are all of Dyess AFB outside of the "USAF Controlled" and "USAF Restricted" areas.
- b. USAF controlled access areas are the midlevel security areas. Presence within the controlled access area is by authorization; however, the movement of authorized personnel in and out of these areas is generally not impeded. Contractor personnel are given access to these areas. The LSPSSA and its appendix A defines security requirements in USAF controlled access areas

- c. The third and highest level of security on Dyess AFB is that within the USAF Restricted areas. These areas are further subdivided to be known as Priority A, Priority B, or Priority C areas. The LSPSSA and its appendix B defines security requirements in the USAF restricted areas.
- 12.1 Referencing the above and the LSPSSA security regulation brochure, the work on this contract will be in a ***USAF Controlled Access***.
 - 12.2 Requests for changes to the work schedule for work in USAF restricted areas, must be submitted a minimum of 7 calendar days in advance for approval and coordination of Dyess AFB Security Forces.
 - 12.3 Dyess Air Force Base is a closed base. All personnel entering must have specific permission of the installation commander for entry. This permission is granted when a Contractor employee is issued an identification card. Information necessary to obtain identification cards will be provided by the Contracting Officer at the performance conference. The Contractor shall be responsible to ensure that all of its employees obtain, and keep on their person at all times while working on the base, a USAF identification card. Upon completion of the work or termination of an employee, the Contractor shall be responsible for turn in of identification cards no longer needed to the Contracting Officer or to the Pass and Registration Office of the Security Forces.
 - a. The Contractor shall supply a list of employees in three copies on the Dyess AFB Form Letter 173. All three (3) copies of the completed list must be reviewed and approved by the Contracting Officer. After review and approval, those listed personnel being authorized entry to Dyess AFB shall proceed to 417 Third St, Room 128, Pass and Registration for issuance of their Contractor Employee Identification card. The Contractor or his designated representative must sign each copy of the list.
 - b. Names must be listed alphabetically on each form. The following information must be listed for each individual, directly opposite his name: Date of Birth, Weight, Height, Color of Hair, Color of Eyes, Social Security Number, Current Address, Drivers License Number (if none, so state), Employer's Company Name, Employer's Company Address and phone number, start and termination date of contract and sponsor's name, organization, phone.
 - c. Changes to the list must be submitted as they occur. Additions must meet the same requirements as the original list. For deletions, only the name of the individual and a reference to the date and contract number of the original list is needed. Contractors must ensure that the pass for any individual deleted from the list is returned to the Pass and Registration Section. If the pass cannot be returned; a letter, signed by the Contractor, shall be submitted stating that the pass could not be retrieved including

an explanation why. The list shall be updated quarterly omitting all previously deleted names.

- d. The Dyess AFB Form Letter 173 is subject to the privacy act of 1974, Authority: 10 U.S.C. 8012 and 5 U.S.C. 552a(b)(7).

Principle purposes: To provide the 7th Security Forces Squadron, and other authorized agencies, with a listing of personnel authorized access to Dyess Air Force Base, Texas as Contractors or Contractor employees.

Routine Uses: To verify the identity of personnel entering Dyess AFB as Contractors.

Disclosure is Mandatory: Failure to provide the information and Social Security Number (SSN) could result in denied access to the Dyess AFB installation.

- 12.4 Contractor shall be required to enclose his contract work area, storage area and employee parking area with 3/8" yellow nylon rope. This rope fence will be supported by fastening it to the top of temporary posts or structures. The posts/structures will be 3 ft (\pm 10%) high. The post/structures spacing and rope tautness will be such that the rope will be no closer than 2 1/2 ft above the walking surface. This fence may be omitted where existing structures bound the contract work area. The intent of this requirement is that all personnel (Contractors', Air Force, and visitors) will know the authorized boundary of each Contractor's area and thereby minimize unauthorized movement, and to help promote safety.
13. IDENTIFICATION OF CONTRACTOR VEHICLES: Contractor vehicles must be marked on each side with company name with either permanent or semi-permanent/magnetic signage.
14. WARRANTIES
- Any warranties given to the Contractor or subContractor at any tier from a manufacturer of equipment or other items which are provided under this contract shall be transferred to the government upon final acceptance. Contractor shall submit in writing a single listing with all applicable warranties attached. Negative responses are likewise required in writing.
15. SUBMITTAL REQUIREMENTS:
- 15.1 The submittals listed on the attached AF Form 66 shall be required and shall be submitted for approval or information using AF Form 3000. Where a submittal cannot be provided within the required submission date, Contractor shall submit in writing a letter stating the reasons why and furnishing a new projected submission date.
- 15.2 Submittal Classification: Submittals are classified as follows and delineated as such on AF Form 66 under the "Remarks" column:

15.2.1 Government Approved- GA:

Government approval is typically required for extensions of design, critical materials, deviations, equipment whose compatibility with the entire system must be checked, and other items as designated by the Contracting Officer. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction," they are considered to be "shop drawings".

15.2.2 For Information Only- FIO:

All submittals not requiring Government approval will be for information only. They are not considered to be "shop drawings" within the terms of the Contract Clause referred to above.

15.3 General Requirements:

- a. GA and FIO submittal data shall be transmitted under separate AF Forms 3000 and assigned different Submission Numbers.
- b. The Contractor shall designate on each AF Form 3000, in the "Submission Number" block, either FIO or GA to show the transmittal type. This procedure allows ready identification of FIO or GA submittals.
- c. Submittals transmitted with AF Form 3000 shall be identified by marking it with the same Submission Number appearing in the "Line Number" column on the AF Form 66.

15.4 Specific Requirements For Information Only (FIO) Submittals:

- a. A single fully coordinated FIO submittal shall be made for each technical section listed/required on the AF Form 66. Each FIO submittal listed on the AF Form 66 shall be submitted as a separate item on the AF Form 3000 in the order they appear on the AF Form 66. Technical data provided with the AF Form 3000 shall conform to the requirements in each Technical Section. Submittals involving colors and interior design shall all be transmitted concurrently.
- b. Items such as mill certificates or other test data that are usually unavailable until the equipment/material is actually manufactured/fabricated must still be identified on the initial AF Form 3000. An explanation stating this data shall be submitted later by Submittal Number (fill in Submission Number) after materials are manufactured/fabricated (or other explanations as appropriate) shall be included with this identification. A separate submittal for long lead time equipment or material may be made if sufficient data is furnished to show contract compliance. (An explanation

shall be provided on a separate sheet, if necessary, explaining ~~why~~ a partial submittal is being made. Explanation shall include the estimated delivery date of the equipment/ material and the Submission Number of the submittal that shall contain data required by the particular specification section for the remaining equipment/materials.) Samples of materials must be submitted along with technical data, not under separate transmittals.

15.5 FIO Submittal Review:

- a. The Contractor has full responsibility for reviewing and certifying that all FIO submittal data and all equipment and/or materials fully comply with the contract. FIO Submittals are for the Government's information and real property record purposes; they will not be approved/disapproved nor returned to the Contractor.
- b. However, the Government may perform quality assurance reviews and rereviews of FIO submittals at any time during the contract. If the Government determines submittal data is incomplete or not in compliance with contract, comments will be provided. Comments will state, "Disagree with Contractor's Certified Compliance" and list items not in compliance or not provided as required by the contract. The Contractor shall respond to all comments by return FIO resubmittal on a new AF Form 3000.

15.6 Specific Requirements for Government (GA) Approved Submittals:

- a. The Contractor is responsible for controlling and ensuring all data submitted is complete and in full compliance with contract requirements.
- b. A separate submittal shall be made for each technical section with GA submittals. FIO submittal data shall not be mixed with GA submittal data.
- c. The government will provide written comments and/or approval/disapproval action as appropriate. One (1) copy of the submittal, along with any comments, will be provided to the Contractor. The Contractor shall provide a resubmittal with all data necessary to show compliance with Government comments on all disapproved submittals.

15.7 Variations/Deviations/Departures from the Contract Drawings or Specifications:

- a. Contractor proposed variations, deviations or departures from the contract requirements shall be noted/marked in red on each copy of the submittal data and shall be provided with a letter attachment to the AF Form 3000 summarizing the proposed variation, deviation, or departure. For FIO submittal deviations an asterisk "*" shall be placed in the block under "Submission Number" next to the "FIO." These submittals will then be automatically redesignated GA. Variations,

deviations, or departures will be processed and approved the same as GA submittals. Variations, deviations, or departures shall contain sufficient information to permit complete evaluation. Additional sheets may be used to fully explain why a variation, deviation, or departure is requested. The Government reserves the right to disapprove or rescind inadvertent approval of submittals containing unnoted/unmarked variations, deviations or departures.

- b. Any submittal annotated by a supplier/vendor with "Field Verify," "Select Color," and the like must be accompanied by the Contractor's written response to the supplier's query.

* * *END OF SECTION* * *

SCHEDULE OF MATERIAL SUBMITTALS													PROJECT NUMBER		PROJECT TITLE			
TO BE COMPLETED BY PROJECT ENGINEER											TO BE COMPLETED BY CONTRACT ADMINISTRATOR							
LINE NUMBER	ITEM OR DESCRIPTION OF ITEM, CONTRACT REFERENCE, TYPE OF SUBMITTAL	NO. OF COPIES REQUIRED										REQUIRED SUB- MISSION DATE	DATE RECEIVED IN CON- TRACTING	DATE TO CIVIL ENGINEER- ING	RETURN SUS- PENSE DATE	FOLLOW-UP	DATE CONTRACTOR NOTIFIED	
		CER TIFI CA TION N OF CO MP LIA NCE	SH OP DR AW ING S	SA MP LES	CO LO R SEL ECT ION	MA NU FA CT URE R'S REC OM ME ND ATI ON S	MA NU FA CT URE R'S WARR ANTY	CAT ALO G DATA	OPE RA TING INS TR UC TION S	REP ORT S	OT HER S						APPROVED	DI APPRO
1	Section 1A, General Para. 2.10 Work Plan Para. 10 Testing Para. 11 As-Built Drawings, Instruction Manuals Para. 12 Security Requirements Para. 14 Warranties Para. 15 Submittal		3				3	3		3	3	*						
2	Section 1A, General Para. 15 Submittal									3	3	*						
3	Section 1B Utilities (Contractor Identified) Para. 2.1 Work Clearance Report Para. 4 AF Form 3000 Fire Hydrant Use									3	3	7 days prior to start						
4	Section 2A, Demolition Para. 3 Submittals - Procedures, Inventory, Site Photographs									3	3	*						
5	Section 2B, Excavation, Trenching, and Backfilling for Utilities Systems Para. 3 Submittals - Reports									3		*						
6	Section 2C, Storm Drainage System Para. 1.2 Submittals - Instructions, Certificates, Samples	3		3						3		*						
7	Section 2E, Pavement Markings Para. 1.3 - Submittals	3										*						
8	Section 9A, Painting, General Para. 1.4 Submittals - Catalog Data, Samples, Certificates	3		3		3						*						
9	Section 9A, Painting, General Para. 1.4 Submittals - Instructions									3		*						
10	Section 15A, Ventilating Control Systems Para. 1.3 Submittals - Data, Drawings		3						3									
11	Section 16A, Electrical Distribution System, Underground Para. 3 Submittals - Compliance, Shop Drawings, Equipment & Materials, Instruction Manuals	3	3							3	3	*						

* As soon as possible but in no case later than 45 calendar days after NTP

SCHEDULE OF MATERIAL SUBMITTALS													PROJECT NUMBER		PROJECT TITLE			
TO BE COMPLETED BY PROJECT ENGINEER													TO BE COMPLETED BY CONTRACT ADMINISTRATOR					
LINE NUMBER	ITEM OR DESCRIPTION OF ITEM, CONTRACT REFERENCE, TYPE OF SUBMITTAL	NO. OF COPIES REQUIRED										REQUIRED SUB- MISSION DATE	DATE RECEIVED IN CON- TRACTING	DATE TO CIVIL ENGINEER- ING	RETURN SUS- PENSE DATE	FOLLOW-UP	DATE CONTRACTOR NOTIFIED	
		CER TIFI CATION OF COMPLIANCE	SH OP DRAWINGS	SAMPLES	COLOR RELECTION	MANUFACTURER'S RECOMMENDATIONS	MANUFACTURER'S WARRANTY	CATALOG DATA	OPERATING INSTRUCTIONS	REPORTS	OTHERS						APPROVED	DATE APPROVED
12	Section 16A, Electrical Distribution System, Underground Para. 3 Submittals - Certifications, Test Reports, Contractor's Data	3						3		3		*						
13	Section 16B, Electrical Work, Interior Para. 3.3 Shop Drawings - Shop Drawings		3									*						
14	Section 16C, Airfield Lighting and Visual Navigation Aids Para. 1.4 Submittals - Data, Protection Plan							3				*						
15	Section 16C, Airfield Lighting and Visual Navigation Aids Para. 1.4 Submittals - Training, Special Tools, Parts List									3		*						
16	Section 16D, Fiber Optics Data Transmission Media for Airfield Lighting Controls Para. 1.4 Delivery of Technical Data - System Drawings, Manufacturer's Data, Certifications, Tests, Operation and Maintenance Manuals, Training	3	3			3			3	3	3	*						
17																		
17																		
18																		
19																		

* As soon as possible but in no case later than 45 calendar days after NTP

TECHNICAL PROVISIONS

SECTION 1B

UTILITIES (CONTRACTOR IDENTIFIED)

1. SCOPE: This section covers identification, interruption and use of utilities.

2. IDENTIFICATION: THE GOVERNMENT DOES NOT KNOW THE LOCATION OF UTILITIES IN THE WORK AREA. Accordingly, the Contractor shall be SOLELY RESPONSIBLE for locating and marking the exact location of all existing utilities within the contract work area prior to any excavating, trenching, backfilling or earth disturbance. The Contractor is SOLELY RESPONSIBLE for any and all damage to existing utilities in the contract work area. Upon request by the Contractor, the Government shall furnish all available information in its possession concerning utilities in the contract work area. However, the accuracy of the information provided by the Government is not guaranteed and is only intended to provide some measure of assistance to the Contractor. The Contractor shall call 7 CS/SCMO (Mr. Lowe) at 696-4391 a minimum of five (5) calendar days in advance to have underground communications cable routes marked. Base Civil Engineering does not have nor shall it provide record drawings of Bell Telephone cable plant. In the event the Contractor identifies utilities in the contract work area which interfere with the newly proposed construction, the Contracting Officer shall be immediately notified and the Government shall take necessary corrective action at no cost to the Contractor. The Contractor shall furnish to the Contracting Officer asbuilt drawings clearly identifying the exact location of all utilities identified in the work area prior to project final inspection.

2.1 Contractor must initiate a Work Clearance Request AF Form 103 (digging permit) from 7 CES/CECC a minimum of seven (7) days prior to the start of any construction work. Excavation is not authorized without issuance of a completed and approved AF Form 103. After initial issue, it is the Contractor's responsibility to keep the Work Clearance Request coordinated and up-to-date/current through the remainder of the contract.

2.2 Any removal/relocation/reconnection of any communication device shall be coordinated in advance with 7 CS/SCMO (Mr. Lowe) at 696-4391. Any removal/relocation/reconnection of any Cable TV device shall be coordinated in advance with 7 CS/SCMO (SSgt Simonton) at 6962400. Communications and Cable TV devices to remain shall be protected as required when work proximity dictates.

3. INTERRUPTIONS:

3.1 Planned Utility Outages: The Contractor shall coordinate all requests for utility outages with the Contracting Officer in writing 14 days prior to date of requested outage. Water, gas, steam, sewer and electrical outages shall be held to a maximum duration of 2 hours unless otherwise approved in writing.

3.2 Unplanned Utility Outages (Accidental Disruption of Utilities): In the event of accidental disruption of any utility, the Contractor will immediately notify the Contracting officer of the unplanned outage. The Contractor will immediately take every reasonable step to repair the damage and will restore the utility to full use as soon as practicable. If the Contractor so desires, and the Government agrees, the Government may complete necessary repairs to the damaged utility and withhold from payments due to the Contractor the necessary amount to defray all costs associated with the repair of the utility.

4. USE: All reasonable quantities of existing utilities will be made available to the Contractor without charge. Any temporary connections or lines required shall be installed, maintained, and removed at the Contractor's expense. Any damage associated with the use of these utilities shall be repaired and/or replaced in a manner satisfactory to the Contracting Officer at Contractor's expense. See Contractor Request for Use of Dyess AFB Fire Hydrants included on page 1B-3.

* * * END OF SECTION * * *

The following information must be prepared and forwarded, on AF Form 3000, Material Approval Submittal, to the Operational Contracting Division for approval, prior to use of base fire hydrants.

Contractor Request for Use of Dyess AFB Fire Hydrants.

1. The _____ Company requests the use of fire hydrant number _____ for the purpose of filling _____ used in the performance of the contract to _____. Period of hydrant use will be _____ to _____. I understand approval is contingent on:

a. The company providing a suitable connection with a Class III Back Flow Preventer (reduced pressure principle device) and screw type globe valve to be attached to the hydrant. The connection will be 2 1/2" National Standard fire thread. The backflow device and valve shall be properly supported to prevent damage to fire hydrant threads.

b. Leaving the connection in place during approval period, except in periods of freezing weather.

c. Insuring the hydrant is fully opened and left in that position during approval period

d. Insuring an approved fire hydrant wrench is used to open/close the hydrant.

e. Insuring all servicing from the hydrant is done at the top of the vehicle or tank. No bottom servicing will be permitted.

f. Using no quick opening valves causing excess water hammer in the main.

g. Discontinuing hydrant use if there is any hydrant malfunction or leakage from underground and reporting same to the fire department, 6962486.

2. I understand and agree that _____ Company assumes full responsibility for any damage to the hydrant, water mains, adjacent grounds, vegetation, buildings, or streets resulting from filling operations.

(Signature)

(Date)

(Print Name)

(Print Title)

TECHNICAL PROVISIONS

SECTION 1C- ENVIRONMENTAL PROTECTION

1. APPLICABLE ENVIRONMENTAL REGULATIONS, LAWS, AND PUBLICATIONSThe documents listed below form a part of this specification. The documents are referred to in the text by the basic designation only.

1.1 Engineering Technical Letters (ETLs):

ETL 91-7	Chlorofluorocarbon (CFC) Limitation in Heating, Ventilation, and Air Conditioning (HVAC) Systems
----------	--

1.2 Dyess AFB Instructions:

32-2001	Base Fire Regulation
32-7001	Conservation and Management of Natural Resources

1.3 Code of Federal Regulations (CFR):

29 CFR	Code of Federal Register, Occupational Safety and Health Administration (OSHA) Rules
29 CFR, Part 1910	Hazardous Waste Operation and Emergency Response
40 CFR	Code of Federal Register, Environmental Protection Agency (EPA) Rules
40 CFR, Part 82	Protection of Stratospheric Ozone
40 CFR, Part 117	Determination of REportable Quantities for Hazardous Substances
40 CFR, Part 260-282	Solid Waste Regulations
40 CFR, Part 302	Designation, Reportable Quantities, and Notification
49 CFR	Code of Federal Register, Department of Transportation (DOT) Rules

1.4 Environmental Protection Agency Publication (EPA):

EPA Publication No. SW-846	Test Methods for Evaluating Solid Waste
----------------------------	---

1.5 Environmental Laws:

Archaeological and Historic Preservation Act (AHPA), 1974

Archaeological Resources Protection Act (ARPA), 1979

Clean Air Act (CAA), 1970 and the 1990 CAA Amendments

Clean Water Act (CWA), 1977 as amended

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, 1980)

Endangered Species Act (ESA), 1973

Emergency Planning and Community Right-to-Know Act (EPCRA)

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) as amended, 1972

Federal Water Pollution Control Act (FWPCA)

National Oil and Hazardous Substances Contingency Plan (NCP), 1980

Occupational Health and Safety Act (OSHA)

Oil Pollution Act (OPA) of 1990

Pollution Prevention Act (PPA), 1990

Resources Conservation and Recovery Act (RCRA), 1974

Safe Drinking Water Act (SDWA), 1973 as amended

Superfund Amendment and Reauthorization Act (SARA)

1.6 State Rules (Texas Administrative Code):

25 TAC

27 TAC

30 TAC

43 TAC

2. **PROTECTION OF RESOURCES:** Construction activities are NOT exempt from air emission, stormwater, hazardous waste, and other environmental compliance rules and regulations. Contractor shall investigate, comprehend, and comply with all environmental rules and regulations applicable to his chosen method of accomplishment of the work under this contract.

- 2.1 Protection of Land Resources: The contractor shall confine his construction activities to areas defined by the plans or specifications. Except in areas to be cleared, do not remove, cut, deface, injure or destroy trees or shrubs without the Contracting Officer's permission. Do not fasten or attach ropes, cables, or guys to existing nearby trees for anchorage unless authorized by the Contracting Officer. Where such use of ropes, cables, or guys is authorized, the Contractor shall be responsible for any resultant damage.
- 2.1.1 Restoration or Replacement of Landscape Damage: Any trees or other landscape feature scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to its original condition at the Contractor's expense. The Contracting Officer will decide what method of restoration shall be used, and whether damaged trees shall be ~~treat~~ or removed and disposed of under requirements for clearing and grubbing. If damaged trees are to be removed, they are to be replaced with equivalent, undamaged trees and landscaping features at the Contractors expense.
- 2.1.2 Post-Construction Cleanup or Obliteration: The contractor shall obliterate all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess materials, or any other vestiges of construction. It is anticipated that excavation, filling, and plowing of roadways will be required to restore the area to near natural conditions which will permit the growth of vegetation thereon. The disturbed areas shall be graded and filled as required, and topsoil shall be spread to a depth of approximately four inches over the entire area and the entire area seeded with 30 pounds (pure live seed) of common Bermuda per 1000 square feet and then watered as required until a lush hardy growth is established to the satisfaction of the Contracting Officer. Restoration to original contours is required unless otherwise directed by the Contracting Officer.
- 2.2 Protection of the Stratospheric Ozone: The Contractor shall comply with 40 CFR Part 82. To the maximum extent practicable, the contractor shall utilize safe alternatives and products made with or containing safe alternatives to Class I or II ozone depleting substances, identified under 42 U.S.C. 7671K. Class I Ozone Depleting Substance is defined in section 602 (a) of CAA and includes the following chemicals:

CFC-11	CFC-12	CFC-13	CFC-111	CFC-112
CFC-113	CFC-114	CFC-115	CFC-211	CFC-212
CFC-213	CFC-214	CFC-215	CFC-216	CFC-217
halon-1211	halon-1301	halon-2402	carbon tetrachloride	methyl chloroform

- 2.2.1 For New HVAC Equipment: Contractor shall utilize acceptable refrigerants per ETL 97 such as:

HCFC - 22 HCFC - 123 HFC - 134A

- 2.3 Protection of Historical and Archaeological Resources: All known Historical, Archaeological, and Cultural Resources, if any, within the contractors work area will be

designated on the contract drawings. The Contractor shall take precautions during the contract to preserve all resources as they existed at the time of contract award and comply with AHPA and ARPA. The contractor shall provide all protective devices such as off limit markings, fencing, barricades or other devices as designated on the contract drawings and shall be responsible for preservation of the sites during this contract.

- 2.3.1 Recording and Preserving Historical and Archaeological Finds: All items having any apparent historical or archaeological interest outside of designated areas which are discovered in the course of any construction activities shall be carefully preserved. The Contractor shall protect the find in place by leaving the archaeological find undisturbed and by using flags to mark a 50 foot radius area around the find. The find shall be immediately reported to the Contracting Officer so that the proper authorities may be notified. All work shall be stopped in the immediate area of the discovery until directed by the Contracting Officer to resume work. Any work required to preserve or protect these finds shall be accomplished before work resumes.
- 2.4 Protection of Water Resources: The Contractor shall not pollute streams, lakes, or reservoirs with fuels, oils, bitumens, calcium chloride, acids, construction wastes, siltation from stormwater runoff, or other harmful materials. It is the responsibility of the Contractor to investigate and comply with all applicable Federal, State, County, and Municipal laws concerning pollution of rivers and streams-particularly the CWA, FWPCA, NCP, OPA, SDWA, and PPA (And all subsequent Amendments). All work under this contract shall be performed in such a manner that objectionable or nuisance conditions will not be created in lakes, reservoirs, or streams through or adjacent to the project areas. For construction sites of more than 5 acres and at least 30 days prior to the start of construction, the Contractor shall file a Notice of Intent (NOI) EPA Form 35106 for stormwater construction activities with the EPA, showing the Contractor's proposed scheme for controlling erosion and pollution. Only 7 CES/CEV personnel may sign/certify the NOI under block V. There shall be no fill, to include trees and vegetation, placed in a wetland or water of the U.S. as they are defined by the CWA or the 1987 Corps of Engineers Manual for wetlands. Wetlands and/or possible wetlands in the work area will be delineated prior to awarding of the contract. The contractor shall be aware of CWA Section 404 requirements and permits and shall be responsible for compliance. Vehicles shall not pass through wetlands unless absolutely necessary, and mats will be placed on the area for protection prior to driving.
- 2.4.1 Erosion Control: The Contractor shall control erosion and disposing of wastes. Surface drainage from cuts and fills within the construction limits, whether or not completed, and from borrow and waste disposal areas, shall, if turbidity producing materials are present, be held in suitable sedimentation ponds, or the areas shall be graded to control erosion within acceptable limits. Temporary erosion and sediment control measures such as berms, dikes, drains, or sedimentation basins, if required to meet the above standards, shall be provided and maintained until permanent drainage and erosion control facilities are completed and operative. The area of bare soil exposed at any one time during construction operations shall be held to a minimum. Unless otherwise approved by the Contracting Officer, the Contractor shall apply as soon as practicable an approved temporary mulch on denuded ground. This shall apply to all areas not subject to appreciable traffic during construction,

including areas that are to receive some form of construction later, if ground is to be exposed 60 days or more. Stream crossing by fording with equipment shall be limited to control turbidity and in areas of frequent crossings temporary culverts or bridge structures shall be installed. Any temporary culverts or bridge structures shall be removed upon completion of the project. Fills and waste areas shall be constructed by selective placement to eliminate to the extent practicable silts or clays on the surface that will erode and contaminate adjacent streams or lakes.

- 2.5 Protection of Fish and Wildlife: The Contractor shall follow all Federal, State, County and Municipal laws regarding the protection of fish and wildlife particularly the ESA. Dyess AFB Instruction 32-7001 shall be followed as well. The Contractor shall at all times perform all work and take such steps required to prevent any interference or disturbance to fish and wildlife. The Contractor shall not alter water flows or otherwise disturb native habitat adjacent to the project area which, in the opinion of the Contracting Officer, are critical to fish or wildlife. Construction of check dams in live streams will not be permitted. Fouling or polluting of water will not be permitted. Wash waters shall be processed, filtered, ponded, or otherwise treated prior to their release into a river or other body of water.
- 2.6 Protection of Air Quality: It is the responsibility of the Contractor to investigate and comply with all applicable Federal, State, County and Municipal laws concerning air pollution, particularly the CAA (And all subsequent Amendments). All work under this contract shall be performed in such a manner that objectionable or nuisance conditions will not be created in the air nor will objectionable particulates be released to the air. No material shall be burned at the project site.
- 2.6.1 Dust Control: The Contractor shall maintain all excavations, embankments, stockpiles, haul roads, permanent access roads, plant sites, waste areas, borrow areas, and all other work areas within or without the project boundaries free from dust in accordance with all applicable local, state, and Federal regulations for the control of dust and particulate emissions. Temporary methods of stabilization consisting of sprinkling with water are required to control dust. Sprinkling with water shall be repeated at such intervals as to keep all parts of the disturbed area at least damp at all times. Gravel paving shall be provided for entrance and exit drives, parking areas, and unpaved roads carrying more than 25 vehicles per day on the construction site.
3. DISPOSAL OF WASTES (HAZARDOUS AND NONHAZARDOUS) GENERATED AT DYESS AFB: (Contractor's attention is directed to Section 1A paragraph 6.1 for waste determination and classification).
- 3.1 Non-Hazardous Wastes: Contractor shall transport and dispose of all nonhazardous wastes to and in a State of Texas approved facility or other disposal facility approved by the state in which the disposal facility is located.
- 3.2 Special Wastes: Special wastes are any wastes that are nonhazardous yet have to be stored, transported, and/or disposed of in a special manner, i.e. petroleum contaminated soil. Contractor shall store, transport and dispose of all Special Wastes in accordance with all Federal, State, and local laws, rules and regulations as applicable. Contractor shall dispose

of Special Wastes in a State of Texas approved facility or other disposal facility approved by the state in which the disposal facility is located. Contractor shall make all necessary arrangements with the disposal facility of his choice for disposal of Special Wastes. Contractor shall prepare all necessary paper work, including but not limited to Biof lading, manifests, etc. at no additional cost to the Government.

4. SPILLS: Dyess AFB maintains, follows, and enforces the following plans regarding spills of classified substances: (NOTE: A spill is defined to include any spilling, overfilling, releasing, emitting, escaping, venting condition, leaking, air upset, or other discharge of a regulated substance. Regulated substances are listed in 40 CFR Parts 117 and 302.)
 - A. Hazardous Materials Emergency Response Plan
 - B. Spill Prevention Control and Counter Measures Plan
 - C. National Oil and Hazardous Substance Pollution Contingency Plan
 - D. Community Right-To-Know Plan

These plans are maintained by the Environmental Flight of Civil Engineering at 710 3rd Street, Dyess AFB. Basically, the Contractor shall take preventive measures (Secondary Containment, avoid overfilling of trucks, etc.) to avoid spills and if a spill were to occur, the Contractor shall immediately notify the Base Fire Department at phone number (915)696 2117. The Base Fire Department is the first responder who will take charge to secure/neutralize the event and to coordinate cleanup/remedial actions. Notification shall be made even if spill is within the cleanup capabilities of the Contractor.

Accordingly, the Contractor shall report all spills immediately, as they occur, to permit proper response by Dyess AFB and Contractor personnel. For example, spillage of asphalt into a field not intended to be asphalted by Contractor's haul truck must be immediately cleaned up as the asphalt becomes a hazardous waste (no longer used for its intended purpose). Contractor may be held liable for all expenses incurred by the Government during and after the spill response including but not necessary limited to spill pads, pillows, booms, vacuum truck and equipment rental, drums, waste transportation, laboratory analysis, and disposal costs.

5. CONTAINERS
 - 5.1 Aerosol Cans: Aerosol cans, after use must be punctured and drained of product and propellant via approved equipment manufactured for that purpose. The empty cans then can be disposed of as ordinary household garbage. Disposal of the internal can contents shall be accomplished according to its waste classification.
 - 5.2 Other Containers: Refer to 30 Texas Administrative Code 335.41f for criteria regarding management and disposal of other containers.

(Note to Designer: Include the following paragraphs nos. 8 thru 13 only when applicable)

6. RELEASE OF FLUIDS TO THE SANITARY SEWER SYSTEM Dyess AFB's sanitary sewer system discharges into the Publicly Owned Treatment Works (POTW) operated by the City of Abilene, Texas. This POTW has established testing requirements for certain

constituents as well as discharge limits of those same constituents. Accordingly, any Contractor performing work at Dyess AFB and contemplating a release of nonhazardous water into the sanitary sewer system shall comply with the testing/release requirements established by the City of Abilene. Contractor is also responsible for any and all testing, monitoring, measuring, documenting, etc. to prove compliance with same. These POTW testing/discharge criteria is included at the end of this section.

CITY OF ABILENE, TEXAS (POTW) TESTING/DISCHARGE CRITERIA

All discharges of non-hazardous water to the sanitary sewer system at Dyess AFB shall be tested for the following constituents and shall comply with the listed discharge limits:

<u>Constituent</u>	<u>Limit</u>
Arsenic	0.80 mg/l
Barium	10.0 mg/l
Beryllium	1.0 mg/l
Cadmium	0.50 mg/l
Chromium	3.00 mg/l
Copper	1.10 mg/l
Cyanide	0.50 mg/l
Lead	1.00 mg/l
Manganese	8.00 mg/l
Mercury	0.02 mg/l
Nickel	3.00 mg/l
Selenium	0.70 mg/l
Silver	0.20 mg/l
Zinc	1.80 mg/l
Benzene	0.40 mg/l
Toluene	14.3 mg/l
Ethyl Benzene	1.4 mg/l
Xylene	10.0 mg/l
Total Petroleum Hydrocarbons	20.0 mg/l or 167 lbs/day
Biochemical Oxygen Demand	2000 lbs/day
Total Suspended Solids	2500 lbs/day
pH	5.5 - 11.0
Fats, Oils, and Greases	834 lbs/day

These constituents shall be analyzed in accordance with the methods set forth in 40 CFR 136 which designates an EPA method number or a method described in the 17th Edition of Standard Methods For the Examination of Water and Wastewater.

As an example and for clarification, nonhazardous water could be placed into a 1500 gallon capacity tank. If a single, representative sample is extracted and analyzed for the above set of constituents and the results were below the limits annotated above, the entire contents of the tank could be discharged into the sanitary sewer system.

END OF SECTION

TECHNICAL PROVISIONS

SECTION 1D - DYESS AFB - FLIGHTLINE RULES

1. **WORK PLAN:** Contractor shall prepare a work plan for all airfield/flightline work and submit such plan to Contracting Officer for approval. Work cannot commence until this Work Plan has been approved by the Contracting Officer. This plan shall schedule all work in all airfield/flightline areas pursuant to these working conditions. This Work Plan shall be kept current.
2. **COORDINATION:**
 - 2.1 **Project Manager:** Contractor shall coordinate/receive approval from the Contracting Officer more than 7 calendar days in advance of performing any flightline work at Dyess AFB.
 - 2.2 **Airfield Manager:** Contractor shall check in with Base Operations at Dyess AFB at 674 Alert Avenue prior to the start of each work day for aircraft traffic advisories and any unusual working conditions.
3. **SCHEDULED MILITARY OPERATIONS:** No airfield/flightline work areas may be available for contract accomplishment during 14 calendar days in 7 calendar day increments during the contract performance period due to scheduled military operations. In these operations, the Contractor will receive notice from the Government not less than 7 calendar days in advance of such nonavailability. The Contractor shall not be eligible for additional compensation when a work area is not available for each of these two 7 calendar day periods of nonavailability. This period is not to be considered as Down Time as defined in Sect. 1A.
4. **ADDITIONAL CRITERIA:** Contractor shall comply with the following additional criteria:
 - 4.1 Storage areas and areas for access to and from the work area will be designated for the Contractor and Contractor's vehicles. Materials and equipment shall not be permitted on other areas of the airfield without approval of the Contracting Officer.
 - 4.2 The Contractor shall remove all equipment and objectionable matter from the work site upon completion of each day's work and have the work area in a safe, clean, and orderly manner to the satisfaction of the Contracting Officer.
 - 4.3 The Contractor shall fully cooperate with operations and security personnel. The Contractor shall not enter or be within 100 feet of the active runway unless equipped with radio(s) and authorized by the Operations Tower. The radio(s) in sufficient quantity for Contractor to control his runway operations shall be provided by Contractor. After approval is given by the base frequency manager for the Contractor to use the frequency, the Contractor will be provided the ramp net frequency. Additionally, the Contractor's jobsite superintendent shall

continuously monitor this ramp net frequency by radio while working anywhere on the airfield - to receive aircraft advisories and/or coordinate work activities.

- 4.4 The Contractor shall give right-of-way to aircraft at all times.
- 4.5 Fire trucks and emergency equipment shall have ingress and egress rights to all areas at all times.
- 4.6 All equipment used on the runway or within 100feet of the near edge of the runway shall be manned and operational at all times.
- 4.7 The Contractor and his personnel shall comply with current Air Force and Base safety rules and regulations. Vehicles and equipment operating on the airfield shall have suitable hazard markings/lights/beacons. Also, hearing protection is required for Contractor's personnel while working on the airfield due to the excessive sound levels generated by aircraft.
- 4.8 No work shall commence on any area until all required equipment, personnel, materials, tools, and supplies are on hand and the Contractor is prepared to accomplish the specified work.
- 4.9 Upon clearance notification, the Contractor shall clear the active runway, north and south accesses, and taxiway areas within 100feet of the active runway of his personnel and equipment within 5-minutes after being notified by the Control Tower or the Contracting Officer's representative to clear the runway.
- 4.10 The Contractor shall be responsible for signage, signaling, lighting, and barricades in the immediate work area where applicable and conforming to the provisions of the Manual of Uniform Traffic Control Devices (OSHA Standards 1926.201 and 1926.202).
- 4.11 For the protection of Government personnel and property, the Contractor shall comply with these minimum safety requirements while performing work under this contract. These requirements are additional to and do not replace the standards promulgated by the Department of Labor under the Occupational Safety and Health Act (OSHA). In the event of a conflict between the OSHA Standards and these requirements, the most stringent shall apply.
- 4.12 All vehicle operators, before driving on the flight line, shall receive special instructions on standard flight line traffic controls/signals and be advised of the particular hazards involved. Contractor shall make arrangements with Base Operations personnel to receive this instruction. Under no circumstances shall a vehicle be operated by an individual who did not receive the special instructions by Base Operations personnel.
- 4.13 Vehicles shall not be driven within 50feet of an aircraft or under any part of an aircraft. Vehicles shall not be driven within 50feet of aircraft fueling or defueling operations. When

parked on the flight line, vehicles and all equipment mounted on wheels which do not have integral braking systems, shall be chocked when left unattended. Vehicles left unattended and parked on the flight line shall be left unlocked with keys in the ignition system.

- 4.14 Under no circumstances shall vehicles be allowed to stand in front of, or be driven into, the path of taxiing aircraft. No vehicle shall be parked or driven closer than ~~50~~ 200 feet in front or 200-feet to the rear of any aircraft when engines are in operation or about to be put in operation.
- 4.15 Vehicle operators shall obey the Dyess AFB speed limits for the area in question.
- 4.16 Airfield Operations: Before airfield operations, vehicle operators shall insure that all equipment carried on their vehicles is properly stowed and secured and that the vehicles are inspected for objects that could damage aircraft. After vehicles are operated on surfaces off the airfield, operators shall stop when reaching the airfield pavement and remove any rocks or other FOD that are wedged between the tires or treads prior to driving onto the airfield.
- 4.17 Vehicle operations on the airfield are under the control of tower personnel. Control tower light signals and radio instructions shall be observed and obeyed by vehicle operators. The following light signals if flashed from the control tower shall also control vehicle traffic:
- | | | |
|----------------------|---|---|
| Steady Green Light | - | Cleared to cross |
| Flashing Green Light | - | Cleared to proceed and watch for lights |
| Steady Red Light | - | Stop. Vehicle shall not be moved |
| Flashing Red Light | - | Clear active runway immediately |
| Red and Green Light | - | General warning. Exercise extreme caution |
- 4.18 Other contractors and/or Air Force Personnel (Performing painting, rubber removal, concrete slab replacement operations, or other repair/construction operations) may be working on the airfield during the execution of this contract. Contractor shall cooperate fully with Government and these other contractors to allow an orderly progression of work. Weekly meetings may be held at the Contracting Officer's office with the working Contractor(s) and other interested parties to discuss and adjust all Contractor's upcoming work schedules. Contractor shall attend these meetings when and if scheduled.
- 4.19 Continuous cleanup of debris from Contractor's activities (Outside of his actual work areas) on streets and the airfield is required. Any loose debris that could damage aircraft is not permitted. An especially thorough cleanup is required at the end of each work day.

END OF SECTION

SECTION 2A

DEMOLITION

1. SCOPE: This section covers alterations and demolition to existing buildings, utilities, and site improvements.
2. GENERAL:
 - 2.1 The plans indicate the extent and general requirements of the demolition, alterations, relocations, and additions to the existing buildings, utilities, and site improvements. If any departures from the drawings are deemed necessary by the contractor, details of such departures and the reasons therefore shall be submitted as soon as possible to the Contracting Officer for action. No such departures shall be made without prior approval of the Contracting Officer.
 - 2.2 Every effort has been made to clearly and fully depict all known existing conditions and items requiring removal, relocation, demolition and/or alteration. Due to the small scale of the drawings and the nature of renovation and rehab work, certain items such as those concealed behind equipment, finishes, or structural members and the like; or those not accessible for inspection or identifiable as abandoned or to be abandoned without destruction; may not be specifically and/or separately defined or shown. The contractor shall provide all required removal, relocation, demolition, and/or alteration of such items reasonably inherent with such renovation and rehabilitation work at no additional cost to the government in accordance with the best commercial practices and these contract documents to provide a complete and useable facility within the scope of the work to be performed. No consideration will be given to the nature of the materials, and all demolition will be designated as unclassified demolition. Demolition of every description and of whatever substances encountered shall be performed to the degree required for the installation of the finishes required herein or as specified.
3. SUBMITTALS
 - 3.1 Procedures: Where required by Section 1A General, the prime Contractor shall submit in writing his detailed proposed procedures for accomplishment of all salvage and/or demolition work. The procedures shall provide for safe conduct of the work, careful removal and disposition of materials specified to be salvaged under Section 1A, protection of property which is to remain undisturbed, coordination with other work in progress, and timely disconnection of utility services. The procedures shall include a detailed description of the methods and equipment to be used for each operation, and the sequence of operations.

- 3.2 Inventory: Where required by Section 1A General, the prime Contractor shall provide an inventory control listing of all existing equipment, furnishings and items to remain and their condition prior to his acceptance and subsequent control under the conditions and provisions of the contract complete.
- 3.3 Site Photographs: Where required by Section 1A General, the Contractor shall provide 35mm color photographs and negatives clearly portraying existing site conditions/landscaping. A minimum of one photograph taken from each facility elevation shall be provided and others as required to fully depict the scope of Contractor required site/landscape restoration within the contract work area limits.
4. PROTECTION:
 - 4.1 Protection of Existing Work: Before beginning any cutting or demolition work, the Contractor shall carefully survey the existing work and examine the drawings and specifications to determine the extent of the work. The Contractor shall take all necessary precautions to ensure against damage to existing work to remain in place, to be reused, or to remain the property of the government. Any damage to such work shall be repaired or replaced as approved by the Contracting Officer at no additional cost to the government. The Contractor shall carefully coordinate the work of this section with all other work and construct and maintain shoring, bracing and supports, as required. The Contractor shall ensure that structural supports are not overloaded and be responsible for increasing structural supports or adding new supports as may be required as a result of any cutting, removal, or demolition work performed under any part of this contract.
 - 4.2 Protection of Buildings from the Weather: The interior of the building and all materials and equipment shall be protected from the weather at all times.
5. DUST AND NOISE CONTROL: The amount of dust, resulting from the demolition shall be controlled to avoid creation of a nuisance in the surrounding area. Use of water will not be permitted. Noise shall be kept to the absolute minimum.
6. REMOVAL: Unless otherwise specified and insofar as is practicable, items and materials shall be removed in a manner inverse to that used in the placing of the items and materials in the buildings. Care shall be taken during removal operations to prevent any unnecessary damage to the buildings, utilities, or site improvements. Any unnecessary damage to the buildings utilities or site improvements resulting from the Contractor's operations shall be repaired at the expense of the Contractor and to the satisfaction of the Contracting Officer.
7. PAINTING AND FINISHING Existing surfaces where items and materials were removed shall be painted and/or patched to match the adjoining surfaces. All new surfaces where specified or required to be painted shall be painted. Existing painted surfaces which are damaged or altered by work under this contract shall be given one coat of paint to match adjacent surfaces. Where an existing painted wall or ceiling has been repaired or patched with new materials, the entire wall or ceiling containing the repaired portion shall

be painted as follows: The repaired portion shall be shall be painted to effect complete hiding and to blend with the adjacent surfaces, and then the entire wall or ceiling given one coat of paint. The finished surfaces shall be free from runs, drops, ridges, waves, laps, brush marks, and variations of color, texture, and finish.

8. SITE RESTORATION: The Contractor shall fully restore the contract work area site to its original condition. Site restoration shall include but not necessarily be limited to turfing (seeding, sprigging, hydromulch), erosion repair and control, planting (trees shrubs), paving, fertilizing, watering, and maintaining as required to return site to its original condition as determined by the Contracting Officer.

- - -END OF SECTION - - -

SECTION 2B

EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D422	(1963; R 1990) Particle-Size Analysis of Soils
ASTM D 1556	(1990) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu.m.))
ASTM D 2487	(1993) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	(1991) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1988; R 1993) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

1.2 DEFINITIONS

1.2.1 Degree of Compaction

Degree of compaction required is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 1A, GENERAL.

1.3.1 Reports

Field Density Tests; GA. Testing of Backfill Materials; GA.

Copies of all laboratory and field test reports within 24 hours of the completion of the test.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Satisfactory Materials

Satisfactory materials include materials classified in ASTM D 2487 as GW, GC, GM, SP, SM, SC, CL, and CH.

2.1.2 Unsatisfactory Materials

Unsatisfactory materials shall be materials that do not comply with the requirements for satisfactory materials. Unsatisfactory materials include, but are not limited to, those materials containing roots and other organic matter, trash, debris, frozen materials and stones larger than 3 inches, and materials classified in ASTM D 2487, as PT, OH, OL, ML, and MH. Unsatisfactory materials also include man-made fills, refuse, or backfills from previous construction.

2.1.3 Cohesionless and Cohesive Materials

Cohesionless materials include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM will be identified as cohesionless only when the fines are nonplastic.

2.1.4 Rock

Rock shall consist of boulders measuring 1/2 cubic meter (1/2 cubic yard) or more and materials that cannot be removed without systematic drilling and blasting such as rock material in ledges, bedded deposits, unstratified masses and conglomerate deposits, and below ground concrete or masonry structures, exceeding 1/2 cubic meter (1/2 cubic yard) in volume, except that pavements will not be considered as rock.

2.1.5 Unyielding Material

Unyielding material shall consist of rock and gravelly soils with stones greater than 3/4 inches in any dimension or as defined by the pipe manufacturer, whichever is smaller.

2.1.6 Unstable Material

Unstable material shall consist of materials too wet to properly support the utility pipe, conduit, or appurtenant structure.

2.1.7 Select Granular Material

Select granular material shall consist of well-graded sand, gravel, crushed gravel, crushed stone or crushed slag composed of hard, tough and durable particles, and shall contain not more than 10 percent by weight of material passing a No. 200 mesh sieve and no less than 95 percent by weight passing the 1 inch sieve. The maximum allowable aggregate size shall be 1 inch, or the maximum size recommended by the pipe manufacturer, whichever is smaller.

2.1.8 Initial Backfill Material

Initial backfill shall consist of select granular material or satisfactory materials free from rocks 1 inch or larger in any dimension or free from rocks of such size as recommended by the pipe manufacturer, whichever is smaller.

2.1.9 Plastic Marking Tape

Plastic marking tape shall be acid and alkali-resistant polyethylene film, 6 inches wide with minimum thickness of 0.004 inch. Tape shall have a minimum of strength of 1750 psi lengthwise and 1500 psi crosswise. The tape shall be manufactured with integral wires, foil backing or other means to enable detection by a metal detector when the tape is buried up to 3 feet deep. The tape shall be of a type specifically manufactured for marking and locating underground utilities. The metallic core of the tape shall be encased in a protective jacket or provided with other means to protect it from corrosion. Tape color shall be as specified in TABLE 1 and shall bear a continuous printed inscription describing the specific utility.

TABLE 1. Tape Color

Red: Electric
Green: Sewer System and Storm Drainage
Systems

PART 3 EXECUTION

3.1 EXCAVATION

Excavation shall be performed to the lines and grades indicated. Excavation shall be unclassified regardless of the nature of the materials involved. During excavation, material satisfactory for backfilling shall be stockpiled in an orderly manner at a distance from the banks of the trench equal to $1/2$ the depth of the excavation, but in no instance closer than 2 feet. Excavated material not required or not satisfactory for backfill shall be disposed of outside the limits of the limits of Government controlled property at the Contractor's responsibility. Grading shall be done as may be necessary to prevent surface water from flowing into the excavation, and any water accumulating therein shall be removed to maintain the stability of the bottom and sides of the excavation. Unauthorized overexcavation shall be backfilled in accordance with paragraph BACKFILLING AND COMPACTION at no additional cost to the Government.

3.1.1 Trench Excavation

The trench shall be excavated as recommended by the manufacturer of the pipe to be installed. Trenches for duct lines shall be excavated as indicated. Trench walls below the top of the pipe shall be sloped, or made vertical, and of such width as recommended in the manufacturer's installation manual. Where no manufacturer's installation manual is available, trench walls shall be made vertical. Trench walls more than 5 feet height shall be shored, cut back to a stable slope, or provided with equivalent means of protection for employees who may be exposed to moving ground or cave in. Vertical trench walls more than 5 feet high shall be shored. Trench walls which are cut back shall be excavated to at least the angle of repose of the soil. Special attention shall be given to slopes which may be adversely affected by weather or moisture content. The trench width below the top of pipe shall not exceed 24 inches plus pipe outside diameter (O.D.) for pipes of less than 24 inches inside diameter and shall not exceed 36 inches plus pipe outside diameter for sizes larger than 24 inches inside diameter. Where recommended trench widths are exceeded, redesign, stronger pipe, or special installation procedures shall be utilized by the Contractor. The cost of redesign, stronger pipe, or special installation procedures shall be borne by the Contractor without any additional costs to the Government.

3.1.1.1 Bottom Preparation

The bottoms of trenches shall be accurately graded to provide uniform bearing and support for the bottom quadrant of each section of the pipe. Bell holes shall be excavated to the necessary size at each joint or coupling to eliminate point bearing. Stones of 3 inches or greater in any dimension, or as recommended by the pipe manufacturer, whichever is smaller, shall be removed to avoid point bearing.

3.1.1.2 Removal of Unyielding Material

Where overdepth is not indicated and unyielding material is encountered in the bottom of the trench, such material shall be removed 4 inches below the required grade and replaced with suitable materials as provided in paragraph BACKFILLING AND COMPACTION.

3.1.1.3 Removal of Unstable Material

Where unstable material is encountered in the bottom of the trench, such material shall be removed to the depth directed and replaced to the proper grade with select granular material as provided in paragraph BACKFILLING AND COMPACTION. When removal of unstable material is required due to the fault or neglect of the Contractor in his performance of the work, the resulting material shall be excavated and replaced by the Contractor without additional cost to the Government.

3.1.1.4 Excavation for Appurtenances

Excavation for manholes, catch-basins, inlets, pullboxes, or similar structures shall be sufficient to leave at least 12 inches clear between the outer structure surfaces and the face of the excavation or support members. Rock shall be cleaned of loose debris and cut to a firm surface either level, stepped, or serrated, as shown or as directed. Loose disintegrated rock and tin strata shall be removed. Removal of unstable material shall be as specified above. When concrete or masonry is to be placed in an excavated area, special care shall be taken not to disturb the bottom of the excavation. Excavation to the final grade level shall not be made until just before the concrete or masonry is to be placed.

3.1.1.5 Jacking, Boring and Tunneling

Unless otherwise indicated, excavation shall be by open cut except that sections of a trench may be jacked, bored, or tunneled if, in the opinion of the Contracting Officer, the pipe, cable, or duct can be safely and properly installed and backfill can be properly installed and backfill can be properly compacted in such sections. Where specifically indicated, jacking and boring shall be provided.

3.1.1.6 Stockpiles

Stockpiles of satisfactory materials shall be placed and graded as specified. Stockpiles shall be kept in a neat and well drained condition giving due consideration to drainage at all times. The ground surface at stockpile locations shall be cleared, grubbed, and sealed by rubber-tired equipment excavated satisfactory and unsatisfactory materials shall be separately stockpiled. Stockpiles of satisfactory materials shall be protected from contamination which may destroy the quality and fitness of the stockpiled material. If the Contractor fails to protect the stockpiles, and any material becomes unsatisfactory, such material shall be removed and replaced with satisfactory material from approved sources at no additional cost to the Government.

3.2 BACKFILLING AND COMPACTION

Backfill material shall consist of satisfactory material, select granular material, or initial backfill material as required. Backfill shall be placed in layers not exceeding 6 inches loose thickness for compaction by hand operated machine compactors, and 8 inches loose thickness for other than hand operated machines, unless otherwise specified. Each layer shall be compacted to at least 95 percent maximum density for cohesionless soils and 90 percent maximum density for cohesive soils, unless otherwise specified.

3.2.1 Trench Backfill

Trenches shall be backfilled to the grade shown.

3.2.1.1 Replacement of Unyielding Material

Unyielding material removed from the bottom of the trench shall be replaced with select granular material or initial backfill material.

3.2.1.2 Replacement of Unstable Material

Unstable material removed from the bottom of the trench or excavation shall be replaced with select granular material placed in layers not exceeding 6 inches loose thickness.

3.2.1.3 Bedding and Initial Backfill

Bedding for storm drainage lines shall be select materials, and shall be a minimum 3 inches in depth. Bedding material shall be compacted to 95 percent maximum density for cohesionless soils and 90 percent maximum density for cohesive soils. Initial backfill material shall be placed and compacted with approved tampers to a height of at least one foot above the utility pipe or conduit. The backfill shall be brought up evenly on both sides of the pipe for the full length of the pipe. Care shall be taken to ensure thorough compaction of the fill under the haunches of the pipe.

3.2.1.4 Final Backfill

The remainder of the trench shall be filled with satisfactory material. Backfill material shall be placed and compacted as follows:

- a. Sidewalks, Turfed or Seeded Areas and Miscellaneous Areas: Backfill shall be deposited in layers of a maximum of 12 inches loose thickness, and compacted to 85 percent maximum density for cohesive soils and 90 percent maximum density for cohesionless soils. Water flooding or jetting methods of compaction will be permitted for granular noncohesive backfill material. Water jetting shall be not be allowed to penetrate the initial backfill. This requirement shall also apply to all other areas not specifically designated above.

3.2.2 Backfill for Appurtenances

After the manhole, catchbasin, inlet, or similar structure has been constructed, backfill shall be placed in such a manner that the structure will not be damaged by the shock of falling earth. The backfill material shall be deposited and compacted as specified for final backfill, and shall be brought up evenly on all sides of the structure to prevent eccentric loading and excessive stress.

3.3 SPECIAL REQUIREMENTS

Special requirements for both excavation and backfill relating to the specific utilities are as follows:

Warning tapes shall be installed directly above the pipe, at a depth of 12 inches below finished grade unless otherwise shown.

3.4 TESTING

Testing shall be the responsibility of the Contractor and shall be performed at no additional cost to the Government.

3.4.1 Testing Facilities

Test shall be performed by an approved commercial testing laboratory or may be tested by facilities furnished by the Contractor. No work requiring testing will be permitted until the facilities have been inspected and approved by the Contracting Officer. The first inspection shall be at the expense of the Government. Cost incurred for any subsequent inspection required because of failure of the first inspection will be charged to the Contractor.

3.4.2 Testing of Backfill Materials

Characteristics of backfill materials shall be determined in accordance with particle size analysis of soils ASTM D 422 and moisture-density relations of soils ASTM D 1557. A minimum of one particle size analysis and one moisture-density relation test shall be performed on each different type of material used for bedding and backfill.

3.4.3. Field Density Tests

Tests shall be performed in sufficient numbers to ensure that the specified density is being obtained. A minimum of one field density test per lift of backfill for every 200 feet of installation shall be performed. One moisture density relationship shall be determined for every 1500 cubic yards of material used. Field in-place density shall be determined in accordance with ASTM D 1556 or ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked and adjusted using the sand cone method as described in paragraph Calibration of the

ASTM publication. ASTM D 2922 results in a wet unit weight of soil and when using this method, ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall be checked along with density calibration checks as described in ASTM D 3017. The calibration checks of both the density and moisture gauges shall be made at the beginning of a job, on each different type of material encountered, at intervals as directed by the Contracting Officer. Copies of calibration curves, results of calibration tests, and field and laboratory density tests shall be furnished to the Contracting Officer. Trenches improperly compacted shall be reopened to the depth directed, then refilled and compacted to the density specified at no additional cost to the Government.

END OF SECTION

SECTION 2D

RUNWAY PAINT REMOVAL

PART 1 - GENERAL

1. The work covered by this section consists of the contractor furnishing all labor, equipment, tools, appliances and materials required to remove all existing paint buildup (down to virgin asphalt or concrete) from all areas on the active runway where paint removal is called for/indicated on the drawings.

PART 2 - DESCRIPTION

2.1 (Not Used)

PART 3 - EXECUTION

3.1 Method of Removal: The removal of paint buildup shall be accomplished by sand blasting to expose a clean/virgin substrate of asphalt or concrete. The sand blasting shall not damage the existing substrate of asphalt or concrete or joint sealant.

3.2 Demonstration of Proficiency (Test Strips): The Contractor shall test his equipment and he shall demonstrate his proposed methods and materials to be used to perform the removal of paint on actual pavement areas designated to have paint removed. Test strips shall be made on each of two pavement types (Asphalt and Concrete) as designated by the Contracting Officer within the indicated work area which is the full operating width of the equipment to be used for the work and a minimum length of 50 feet. The determination of satisfactory removal shall be in accordance with paragraph COMPLIANCE TESTING. The Contractor shall not proceed with the work until the results of the test section are satisfactory to the Contracting Officer.

3.3 Compliance Testing: The test strip shall not have any remaining discoloration from paint. The process shall remove all paint and/or evidence of paint.

3.4 Pavement Damage Repairs: Any damage to the pavement surface or the joint sealant shall be repaired by the Contractor at his expense. Methods and materials to be used for repairs shall be approved by the Contracting Officer prior to performance of the repairs. Repairs shall be effected and completed within the performance period of the contract.

3.5 Clean Up: All debris, waste, and byproducts generated by the paint removal operations shall be collected and removed from the airfield and disposed of in strict compliance with all applicable state, local and federal environmental statutes and regulations, including, but not limited to, regulations promulgated under the Resource Conservation Recovery Act, 42 U.S.C. 6901, et. seq., the Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. 9601, et. seq., and the Hazardous Materials Transportation Act, 49 U.S. 1801, et. seq.

END OF SECTION

SECTION 2E

PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 Scope: The work covered by this section of the specification consists of the Contractor furnishing all paint, labor, equipment, layout of markings, materials, and performing all operations in connection with the application of traffic paints and reflective media to pavements where modified by this contract and where indicated.

1.2 Applicable Publications

1.2.1 The following specifications and publications form a part of this specification:

1.2.1.1 Federal Specifications (FS):

FS TTP-1952 (Rev. B) Paint, Traffic,
and Airfield Marking,
Water Emulsion Base

FS TT-B-1325 (Rev. B) Beads (Glass
Spheres); Retro-
Reflective

1.3 Submittals: Provide manufacturer's certification certifying compliance with specifications for paint and reflective media. Certification shall be submitted to and approved by the Contracting Officer prior to actual use in the work.

PART 2 - PRODUCTS

2.1 Materials: Comply with the provisions of applicable related specifications and purchase descriptions listed herein. Paint shall be homogenous, easily stirred to smooth consistency and shall show no objectional characteristics during prolonged storage. The composition and quality of the paint shall be such as to produce a strong and adherent binder for the reflective media, form a firm bond with the pavement on which applied, and have sufficient resistance to weathering and traffic.

2.2 Pigmented Binder: Pigmented binder (Paint) covered by FS TTP-1952 shall be used for all markings.

2.3 Reflective Media: Reflective spheres with a reflective index not less than 1.90 as covered in FS TT-B-1325, Type III, High Index of Refraction: Gradation A (Coarse, Dropn) shall be used for all reflective markings.

PART 3 - EXECUTION

3.1 Surface Preparation:

3.1.1 Where new paint is indicated for surfaces presently coated with existing paint, said existing paint shall be removed prior to application of the new paint. Paint removal shall be performed in accordance with SECTION 2E, RUNWAY PAINT REMOVAL.

3.2 Weather Limitation: The paint shall not be applied to damp or wet pavement surfaces, or when inclement weather threatens to interrupt normal progress of the work. Paint shall not be applied when the ambient air temperatures are below 50 degrees F or exceed 95 degrees F, when the relative humidity exceeds 90 percent, or when the wind velocity exceeds 15 miles per hour.

3.3 Rate of Application:

3.3.1 Pigmented binder (paint) shall be applied at the rate of one gallon spread evenly over a pavement area of 105, plus or minus 5, square feet for markings. That is equivalent to 14 to 16 mils wet thickness or 7 to 8 mils dry thickness.

3.3.2 Reflective Media: Reflective glass spheres shall be applied uniformly to the wet paint at a rate of ten pounds of glass spheres for each gallon of paint. The maximum acceptable tolerable level shall be plus or minus one-half pound of glass spheres per gallon of paint. Retroreflectivity readings of at least 300 shall be achieved as measured 24 hours after laydown of paint and beads, by average random 10 readings per 1000 linear feet, readings on a Mirolux 12 retroreflectivity meter as furnished by MicroBran Assembler, Inc., 107 East 27th Street, Paterson, New Jersey, 07515.

****END OF SECTION****

SECTION 3A

CONCRETE FOR BUILDING CONSTRUCTION (MINOR REQUIREMENTS)

PART 1 - GENERAL

1. APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.1 American Concrete Institute (ACI) Standard:

318-83 Building Code Requirements for Reinforced Concrete

1.2 American Society for Testing and Materials (ASTM) Publication:

C 94-86b Ready-Mixed Concrete

2. GENERAL REQUIREMENT: The work shall be in conformance with ACI 318, part entitled "Construction Requirements," except as specified herein.

2.1 Compressive Strength: Concrete mixes shall be proportioned to obtain compressive strength in 28 days of 3000 psi for reinforced concrete and 3000 psi for nonreinforced concrete. The compressive strengths shall be reached in 7 days when high early-strength cement is used. 2.2 Air Content: Total air content of exterior concrete shall be maintained at 5 to 7 percent by volume of concrete. Concrete for duct encasement shall have a 28 day compressive strength of 2500 pounds per square inch.

2.3 Slump: Slump shall be 3 to 4 inches for walls and 2 to 3 inches for other work.

3. STORAGE: Materials shall be stored so as not to deteriorate or become contaminated.

PART 2 - PRODUCTS

4. MATERIALS shall conform to the following:

4.1 Abrasive Aggregate: Aluminum oxide, emery, or silicon carbide abrasive.

4.2 Anchorage Items: Standard manufactured item of the types indicated or required for the application.

4.3 Concrete Materials: ASTM C 94, cement type optional. Only one brand of any one type of cement shall be used for exposed concrete surfaces of any individual structure.

4.4 Curing Materials: Impervious sheet or membrane-forming curing compound. Impervious sheet shall be white opaque polyethylene 4 mil thick, waterproof kraft paper, or polyethylene-coated burlap. Membrane-forming curing compound shall be of commercial formulation, sprayable, nontoxic, and of the

type that will dry within 4 hours and form a film highly resistant to moisture loss from concrete while curing. Compound shall be clear with fugitive dye, resin base or chlorinated-rubber-base-type.

4.5 Dowels: Plain carbon steel bars, minimum yield point of 40,000 psi for use in slabs on grade.

4.6 Expansion Joint Filler Strips: Premolded nonextruding, resilient bituminous or nonbituminous type for use in concrete paving or construction, 3/8 inch thick.

4.7 Form Coating: Nonstaining form oil or form release agent that will not deleteriously affect concrete surfaces nor impair subsequent applications.

4.8 Form Materials: Plywood or hardboard especially made for concrete form use or other materials that will produce the specified finishes without adversely affecting the concrete surfaces.

4.9 Form Ties: Metal, factory-fabricated removable or snap-off, that will not leave holes less than 1/4 inch nor more than 1 inch deep and not more than 1 inch in diameter.

4.10 Joint Sealant: Hot- or cold-applied, made specifically for sealing joints in concrete against moisture infiltration.

4.11 Reinforcement: Deformed, Grade 40 or Grade 60 billet steel. Mesh shall be welded steel wire fabric with wires at right angles to each other.

PART 3 - EXECUTION

5. FORMWORK shall be made mortar tight, properly aligned and adequately supported to produce concrete conforming accurately to the indicated shapes, lines, dimensions, and with surfaces free of offsets, waviness, or bulges. Where surfaces are to be exposed panels shall be manufacturer's stock size material, using smaller panels cut to required dimensions only where required by openings and joints. Unless otherwise shown, exposed external corners shall be chamfered, beveled, or rounded by moldings placed in the forms. Surfaces shall be thoroughly cleaned and coated before each use. Forms shall be removed at a time and in a manner that will not injure the concrete.

6. REINFORCEMENT shall be fabricated to the shapes required. Reinforcement shall be interrupted 2 inches clear on each side of joints in slabs on grade and perimeter joints. When mesh reinforcement shall be continuous between joints in slabs on grade. Laps shall be at least one full mesh plus 2 inches; staggered to avoid continuous lap in either direction; and securely wired or clipped with the standard clips. Mesh shall be supported on precast concrete units or specifically designed wire fabric supports fabricated of plastic in a manner that will support the mesh at the minimum height indicated. Dowels and tie bars in slabs on grade shall be installed at right angles to joints; accurately aligned parallel to the finished surface; and rigidly held in place and supported during concrete placement. One end of dowels shall be bled or greased.

7. INSTALLATION OF ANCHORAGE ITEMS shall be as indicated or required to insure sufficient anchorage for purpose intended.

8. PLACING: Concrete footings and exterior slabs shall be placed upon clean undisturbed surfaces free from frost, ice, and water. Dry or pervious surfaces receiving concrete shall be covered with impervious sheet materials. Concrete may be placed directly on impervious surfaces that are thoroughly moistened but not muddy. Concrete shall be placed in layers not ~~or~~ 12 inches deep except that all slabs shall be placed in a single layer. During cold weather, ~~inplace~~ concrete shall be protected from freezing throughout the curing period. Concrete to receive other construction shall be screeded to the proper level.

9. CONSOLIDATION OF CONCRETE: Except for slabs 4 inches or less, each layer of concrete shall be consolidated with internal concrete vibrators supplemented by handspading, rodding, and tamping. Vibrating equipment shall be adequate to thoroughly consolidate the concrete. Concrete in slabs 4 inches and less shall be consolidated by compacting and screeding.

10. FINISHING CONCRETE:

10.1 Formed Surfaces: Fins and loose material shall be removed. Unsound concrete, voids over 1/2 inch in diameter, and tie-rod and bolt holes shall be cut back to solid concrete, reamed, brushed, coated with cement grout, and filled solid with a stiff portland cement-sand mortar mix. Patchwork shall finish flush with adjoining concrete surfaces and, where exposed, shall ~~match~~ adjoining surfaces in texture and color. Patchwork shall be cured for 72 hours. White portland cement shall be used as needed to attain color match.

10.2 Unformed Surfaces: Surfaces shall be finished to a true plane with no deviation exceeding 5/16 inch when tested with a 10-foot straightedge. Surfaces shall be pitched to drains. Surfaces shall be screeded and floated to the required finish level with no coarse aggregate visible before finishing as specified below.

10.2.1 Monolithic Finish: Monolithic finish shall be given to slabs unless otherwise specified. After the surface moisture has disappeared, floated surfaces shall be steel-troweled to a smooth, even, dense finish free from blemish including trowel marks.

10.2.2 Nonslip Finish: Nonslip finish shall be given to exterior building entrances, sidewalks, and other surfaces so indicated by brooming with a fiberbristle brush in a direction transverse to that of main traffic.

11. CURING shall start as soon as free water has disappeared ~~fm~~ concrete surfaces after placing and finishing. Curing materials shall be applied and maintained so as to protect the concrete from moisture loss for 7 days. Curing shall be accomplished by impervious sheet or membrane forming curing compound. Concrete surfaces shall be thoroughly wetted before covering with impervious sheet materials. Membrane forming curing compound shall be applied with mechanical spraying equipment at a coverage of not more than 300 square feet per gallon. Surfaces of compound ~~damaged~~ during curing shall be resprayed.

END OF SECTION

SECTION 9A

PAINTING, GENERAL

PART 1 GENERAL

1.1 SUMMARY (Not Applicable)

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 659 (1986) Evaluating Degree of Chalking of Exterior Paints

FEDERAL SPECIFICATIONS (FS)

FS TT-C-555	(Rev. B; Am. 1) Coating, Textured (for Interior and Exterior Masonry Surfaces)
FS TT-E-489	(Rev. G) Enamel, Alkyd, Gloss (for Exterior and Interior Surfaces)
FS TT-E-508	(Rev. C; Am. 1) Enamel, Interior, Semigloss, Tints and White
FS TT-E-509	(Rev. B; Am. 2) Enamel, Odorless, Alkyd, Interior, Semigloss, White and Tints
FS TT-E-543	(Rev. A; Am. 1) Enamel, Interior, Undercoat, Tints and White
FS TT-E-545	(Rev. B; Am. 1) Enamel, Odorless, Alkyd, Interior Undercoat, Flat, Tints and White
FS TT-P-19	(Rev. D) Paint, Latex (Acrylic Emulsion, Exterior Wood and Masonry)
FS TT-P-29	(Rev. J; Am. 1; Int. Am. 2) Paint, Latex Base, Interior, Flat, White and Tints
FS TT-P-30	(Rev. E; Am. 1) Paint, Alkyd, Odorless, Interior, Flat White, and Tints
FS TT-P-38	(Rev. D; Am. 1) Paint, Aluminum, Ready Mixed
FS TT-P-91	(Rev. D; Am2) Paint, Rubber-Base, for Interior Use (Concrete and Masonry Floors)

FS TT-P-506	(Rev. K; Am. 1) Enamel, Alkyd, GLoss, Tints and White (for Interior Use)
FS TT-P-645	(Rev. A) Primer, Paint, Zinc Chromate, Alkyd Type
FS-TT-E-505	(Rev. B) Enamel (Odorless, Alkyd, Interior, High Gloss)

MILITARY SPECIFICATIONS (MS)

MS MIL-P-28582	(Basic) Primer Coating, Exterior, Lead PigmentFree (Undercoat for Wood, Ready-Mixed, White and Tints)
MS MIL-P-26915	(Rev. C) Primer Coating, Zinc Dust Pigmented, for Steel Surfaces

STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC-PA 1	(1982) Shop, Field, and Maintenance Painting
SSPC-SP 1	(1982) Solvent Cleaning
SSPC-SP 3	(1982) Power Tool Cleaning
SSPC-SP 7	(1985) Brush-Off Blast Cleaning
SSPC-Paint 5	(1982) Zinc Dust, Zinc Oxide and Phenolic Varnish Paint
SSPC-Paint 11	(1982) Red Iron Oxide, Zinc Chromate, Raw Linseed Oil and Alkyd Paint
SSPC-Paint 21	(1982) White or Colored Silicone Alkyd Paint
SSPC-Paint 27	(1982) Basic Zinc Chromate - Vinyl Butyral Wash Primer

1.3 DEFINITION

The term "paint" as used herein includes emulsions, enamels, paints, stains, varnishes, sealers, cement-emulsion filler, and other coatings, whether used as prime, intermediate, or finish coat.

1.4 SUBMITTALS

The following shall be submitted in accordance with Section 1A- GENERAL.

1.4.1 Manufacturer's Catalog Data; GA

The Contractor shall submit for approval the names, quantity represented, and intended use for the proprietary brands of materials proposed to be substituted for the specified materials when the required quantity of a particular color is 50 gallons or less.

1.4.2 Manufacturer's Instructions; FIO

Manufacturer's current printed product description, materials safety and technical data sheets shall be furnished for all coating systems.

1.4.3 Samples; GA

While the material is at the site or source of supply, and at a time agreeable to the Contractor and the Contracting Officer, a 1-quart sample of each color and batch, except for quantities of 50 gallons or less, shall be taken by random selection from the sealed containers by the Contractor in the presence of a representative of the Contracting Officer. The contents of the sampled containers shall be thoroughly mixed to ensure that the sample is representative. Samples shall be identified by designated name, specification number, manufacturer name and address, batch number, project contract number, intended use, and quantity involved.

1.4.4 Certificates of Compliance; GA

Except for lead-based metal primers for use in concealed spaces, a certificate of compliance shall be furnished attesting that all paints proposed for use in residential structures or other structures which are readily accessible to children contain not more than 0.06 percent lead, as defined in paragraph "HAZARDOUS MATERIALS RESTRICTIONS."

1.5 PACKAGING, LABELING, AND STORAGE

Paints shall be in sealed containers that legibly show the designated name, formula or specification number, batch number, color, quantity, date of manufacture, manufacturer's formulation number, manufacturer's directions including any warnings and special precautions, and name of manufacturer. Pigmented paints shall be furnished in containers not larger than 5 gallons. Paints shall be stored on the project site or segregated at the source of supply sufficiently in advance of need to allow 30 days for testing. Emulsion paints shall be stored to prevent freezing.

1.6 COLORS AND TINTS

Colors shall conform to FED-STD 595 and shall be as listed on the drawings. Interior doors as selected by the Contracting Officer. Tinting of vinyl type paints shall be done by the manufacturer. Stains shall conform in shade to manufacturer's standard color. The color of the undercoats shall vary slightly from the color of the next coat.

1.7 APPROVAL OF MATERIALS

When samples are tested, approval of materials will be based on tests of the samples; otherwise, materials will be approved based on test reports furnished with them. If materials are approved based on test reports furnished, samples will be retained by the Government for testing should the materials appear defective during or after application. In addition to any other remedies under the contract the cost of retesting defective materials will be at the Contractor's expense.

1.8 ENVIRONMENTAL CONDITIONS

Unless otherwise recommended by the paint manufacturer, the ambient temperature shall be between 45 and 95 degrees F when applying coatings other than water-thinned, epoxy, moisture-cure polyurethane, and liquid glaze coatings. Water-thinned coatings will be applied only when ambient temperature is between 50 and 90 degrees F. Epoxy, moisture-cure polyurethane, and liquid glaze coatings will be applied only within the minimum and maximum temperatures recommended by the coating manufacturer. Moisture-cure polyurethane will not be applied when the relative humidity is below 30 percent. Paints, except water-thinned types, shall be applied only to surfaces that are completely free of moisture as determined by sight or touch. In no case shall paint be applied to surfaces which have visible frost or ice.

PART 2 PRODUCTS

2.1 MATERIALS

Materials shall conform to the respective specifications listed for use in PART 3 EXECUTION and to the requirements herein except when the required amount of a material of a particular color is 50 gallons or less, in which case an approved first-line proprietary paint material with similar intended usage and color to that specified may be used.

2.1.1 Exterior Oil Paint

Exterior oil paint shall conform to the following:

- a. Light tints: FS TTP-102, Type II.
- b. Red or brown: FS TTP-31.
- c. Other deep colors: FS TTP-37.

2.1.2 Ferrous-Metal Primer

Ferrous-metal primer shall conform to SSPC-Paint 11.

2.1.3 International Orange Enamel

Enamel shall conform to FS TFE-489 or SSPC-Paint 21, Type I. Color shall conform to FED-STD 595, Color Number 12197-1.

2.2 HAZARDOUS MATERIALS RESTRICTIONS

Paints and painting practices shall comply with all applicable state and local laws enacted to insure compliance with Federal Clean Air Standards.

2.2.1 Mercury

Mercurial fungicides shall not be used in exterior oil paints.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

Items not to be painted which are in contact with or adjacent to painted surfaces shall be removed or protected prior to surface preparation and painting operations. Exposed ferrous metals, including nails on or in contact with surfaces to be painted with water-thinned paints, shall be spot-primed with a suitable corrosion-inhibitive primer capable of preventing flash rusting and compatible with the coating specified for the adjacent areas. All surfaces shall be clean and free of foreign matter before application of paint or surface treatments. Oil and grease shall be removed with clean cloths and cleaning solvents prior to mechanical cleaning. Cleaning solvents shall be of low toxicity with a flashpoint in excess of 100 degrees F. Cleaning shall be programmed so that dust and other contaminants will not fall on wet, newly painted surfaces. Items removed prior to painting shall be replaced when painting is completed.

3.1.1 Concrete Surfaces

Surfaces shall be allowed to dry at least 30 days before painting, except concrete slab on grade which shall be allowed to cure 90 days before painting. Glaze, efflorescence, laitance, dirt, grease, oil, asphalt, surface deposits of free iron and other foreign matter shall be removed prior to painting.

3.1.2 Ferrous Surfaces

Ferrous surfaces that have not been shopcoated shall be solvent-cleaned. Surfaces that contain loose rust, loose mill scale, and other foreign substances shall be cleaned mechanically with power tools according to SSPC-SP 3 or by sandblasting according to SSPC-SP 7. After cleaning, one coat of ferrous-metal primer shall be applied to all ferrous surfaces to receive paint other than asphalt varnish and vinyl paint. The semitransparent film applied to some pipes and tubing at the mill is not to be considered a shop coat, but shall be overcoated with the specified ferrous-metal primer prior to application of finish coats. Shopcoated ferrous surfaces shall be protected from corrosion by treating and touching up corroded areas immediately upon detection.

3.1.3 Galvanized and Nonferrous Surfaces

Galvanized, aluminum and aluminum alloy, lead, copper, and other nonferrous surfaces to be painted shall be solvent cleaned in accordance with SSPCSP 1 and treated with a vinyl type wash coat meeting the requirements of SSPC Paint 27.

3.1.4 Surfaces Previously Painted

Previously painted surfaces specified to be repainted or damaged during construction shall be thoroughly cleaned of all grease, dirt, dust or other foreign matter. Blistering, cracking, flaking and peeling or other deteriorated coatings shall be removed. Slick surfaces shall be roughened. Damaged areas such as, but not limited to, nail holes, cracks, chips, and spalls shall be repaired with suitable material to match adjacent undamaged areas. Edges of chipped paint shall be feather edged and sanded smooth. Rusty metal surfaces shall be cleaned as per SSPC requirements. Solvent, mechanical, or chemical cleaning methods shall be used to provide surfaces suitable for painting. Chalk shall be removed so that when tested in accordance with ASTM D 659, the chalk resistance rating is no less than 8. New, proposed coatings shall be compatible with existing coatings. If existing surfaces are glossy, the gloss shall be reduced.

3.1.5 Adhesion and Compatibility Test:

When the Contracting Officer determines that the compatibility of proposed new coatings with existing coatings is questionable, the specified first coat for each surface in question shall be applied to a small area of the surface, approximately 12 inches square, and allowed to dry. After a reasonable length of time, such as the paint manufacturer's recommended drying time, the paint sample shall be tested for adhesion with a sharp knife. If the paint sample adheres well and does not readily peel off, painting shall proceed. If the paint doesn't adhere, the surface may be sufficiently roughened, cleaned and retested or the existing paint completely removed to the substrate and painted as specified for new surfaces.

3.2 MIXING AND THINNING

Unless otherwise recommended by the manufacturer, paints may be thinned immediately prior to application with not more than 1 pint of suitable thinner per gallon when necessary to suit conditions of surface, temperature, weather, and application methods. The use of thinner shall not relieve the Contractor from obtaining complete hiding, full film thickness, or required gloss. Paints of different manufacturers shall not be mixed.

3.2.1 Vinyl-Type Wash Coat

SSPC-Paint 27 wash coat shall be mixed by adding one volume of acid component to four volumes of resin component as follows: first, the resin component will be mixed to break up settled pigment; the acid component will then be added slowly to the resin component with constant stirring. The wash coat shall be used within 8 hours. The material may be reduced with normal

butyl alcohol, 99 percent isopropyl alcohol, or denatured ethanol if thinning is required to maintain a wet spray.

3.3 APPLICATION

Paint may be applied by brush, roller, or spray. At the time of application, paint shall show no signs of deterioration. Uniform suspension of pigments shall be maintained during application. Each coat of paint shall be applied so dry film shall be of uniform thickness and free from runs, drops, ridges, waves, pinholes or other voids, laps, brush marks, and variations in color, texture, and finish. Hiding shall be complete. Rollers for applying paints and enamels shall be of a type designed for the coating to be applied and the surface to be coated. Special attention shall be given to insure that all edges, corners, crevices, welds, and rivets receive a film thickness equal to that of adjacent painted surfaces. Paints, except water-thinned types, shall be applied only to surfaces that are completely free of moisture as determined by sight or touch.

3.3.1 Ventilation

Adequate ventilation shall be provided during paint application. Respirators shall be worn by all persons engaged in spray painting. Adjacent areas shall be protected by approved precautionary measures.

3.3.2 First Coat

The first coat on concrete surfaces shall include repeated touching up of suction spots or overall application of primer or sealer to produce uniform color and gloss.

3.3.3 Time Between Surface Preparation and Painting

Surfaces that have been cleaned, pretreated, and otherwise prepared for painting shall be given a coat of the specified first coat as soon as practical after such pretreatment has been completed, but prior to any deterioration of the prepared surface.

3.3.4 Coating Progress

Sufficient time shall elapse between successive coats to permit proper drying. This period shall be modified as necessary to suit weather conditions. Oil-based or oleoresinous solvent-type paints shall be considered dry for recoating when the paint feels firm, does not deform or feel sticky under moderate pressure of the thumb, and the application of another coat of paint does not cause the undercoat to lift or lose adhesion.

3.3.5 Metal Surfaces

First coats other than vinyl paints or vinyl-type wash coats shall be applied by brush. The three-coat paint systems specified for exterior and interior ferrous surfaces shall be applied so that

their dry-film thickness at any point shall be not less than 4.0 mils, with the primer having a minimum dry-film thickness of 1.5 mils.

3.3.6 Textured Coating

Application shall be as specified in the manufacturer's printed directions at a rate of 45 to 55 square feet per gallon in one coat.

3.3.7 Vinyl Type Wash Coat

Vinyl-type wash coat shall be applied by brush or spray to give a dry-film thickness of 0.3 mil to 0.5 mil. A wet spray shall be maintained at all times. Surfaces shall be permitted to dry for 1 hour and shall be coated as soon as practical within 24 hours and prior to any deterioration or accumulation of dust or dirt.

3.4 SURFACES TO BE PAINTED

Surfaces listed in the "PAINTING SCHEDULE," other than those listed in paragraphs "SURFACES NOT REQUIRING PAINTING" and "SURFACES FOR WHICH PAINTING IS PROHIBITED," will receive the surface preparation, paints, and number of coats prescribed in the schedule.

3.5 SURFACES NOT REQUIRING PAINTING

The following listed items will not require painting:

- a. Concrete floors.
- b. Exterior and interior aluminum and stainless steel.
- c. Exterior caulking and sealants.

3.6 SURFACES FOR WHICH PAINTING IS PROHIBITED

- a. Door hardware.
- b. Labels of testing agencies such as Underwriters' Laboratories, Inc.

3.9 PAINTING SCHEDULE

The "PAINTING SCHEDULE" at the end of this section prescribes the surfaces to be painted, and the number and types of coats of paint required.

3.9.1 Contractor's Options

The "PAINTING SCHEDULE" provides for Contractor's options as specified by the word "or" between options for one coat and "---or---" between options for coating systems.

3.9.2 Shop-Painted Items

Surfaces of items finish-painted by the manufacturer, or specified to be finish-painted under other sections of the specifications, are exempted from the requirements for surface preparation and painting. Shopprimed items shall receive surface preparation and finish painting as required by this section.

PAINTING SCHEDULE

Surface	First Coat	Second Coat	Third Coat
Exterior ferrous surfaces, exposed, unless otherwise specified.	Exterior oil paint FS TT-E-489 Class A ---or--- SSPC-Paint 11 Type I ---or--- FS TT-P-645	Exterior oil paint FS TT-E-489 Class A ---or--- SSPC-Paint 21/SSPC-Paint 21 Type I	
Exterior galvanized surfaces.	SSPC-Paint 5 or MS MIL-P-26915, Type I, Class A	Exterior oil paint	
Exterior aluminum and aluminum-alloy surfaces.	FS TT-P-645 Class A or SSPC-Paint 21, Type I	FS TT-E-489	
Interior concrete ceilings.	FS TT-C-555 Type I	FS TT-P-29	
Interior concrete masonry units, plaster, gypsum board, and	FS TT-P-29 ---or--- FS TT-P-650	FS TT-P-29 FS TT-P-30	

concrete, except
concrete floors,
unless otherwise
specified.

Interior exposed
ferrous surfaces,
unless otherwise
specified.

FS TT-P-30

FS TT-P-30

FS TT-E-543
or
FS TT-E-545

FS TT-E-508
or
FS TT-E-509

FS TT-E-543
or
FS TT-E-545

FS TT-E-505
or
FS TT-E-506

FS TT-P-38

FS TT-P-38

Interior galvanized
surfaces, unless
otherwise specified.

Two coats of paint to match
adjacent areas

****End of Section****

SECTION 16B

ELECTRICAL WORK, INTERIOR

PART 1 - GENERAL

1. APPLICABLE PUBLICATIONS: The publications listed below, form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.1 Federal Specifications (Fed. Spec.):

J-C-30A & Am-1	Cable and Wire, Electrical (Power, Fixed Installation)
L-C-530C	Coating, Pipe, Thermoplastic Resin
L-P-387A & Am-1 & Am-2	Plastic Sheet, Laminated, Thermosetting (For Designation Plates)
L-P-1035A	Plastic Molding Material, Vinyl Chloride Polymer and Vinyl Chloride-Vinyl Acetate Copolymer, Rigid
W-B-30A & Am-2	Ballast, Fluorescent Lamp (Non-Polychlorinated Biphenyl Type)
W-C-375B/GEN	Circuit Breakers, Molded Case; Branch Circuit and Service (General Specification)
W-C-586C	Conduit Outlet Boxes, Bodies, and Entrance Caps, Electrical: Cast Metal
W-C-596F/GEN & Suppl 1	Connector, Electrical, Power, General Specification for
W-C-1094A	Conduit and Conduit Fittings Plastic, Rigid
W-F-406D	Fittings for Cable, Power, Electrical and Conduit, Metal, Flexible
W-S-865C & Am-1 & Int Am-2	Switch, Box, (Enclosed), Surface Mounted)
W-F-408D	Fittings for Conduit, Metal, Rigid (Thick Wall and Thin-Wall (EMT) Type)
W-F-1234A	Fixture, Lighting (Fluorescent Lamp, Industrial)

W-F-1662A & Int Am-2	Fixture, Lighting (Fluorescent, Alternating Current, Recessed and Surface Ceiling)
W-J-800E & Am-1	Junction Box: Extension, Junction Box; Cover, Junction Box (Steel Cadmium, or Zinc Coated)
W-L-00116D	Lamps, Fluorescent (General Specification)
W-P-115B	Panel, Power Distribution
W-P-455A & Am-6	Plate, Wall, Electrical
W-S-610C & Am-1	Splice Conductor
HH-I-553C & Am-1	Insulation Tape, Electrical (Rubber, Natural and Synthetic)
HH-I-595C	Insulation Tape, Electrical, Pressure Sensitive Adhesive, Plastic
WW-C-00540C & Int Am-1	Conduit, Metal, Rigid: and Coupling, Elbow, and Nipple, Electrical Conduit: Aluminum
WW-C-566C	Conduit, Metal, Flexible
1.2 American Society for Testing and Materials (ASTM) Publication:	
D 69-85	Friction Tapes
1.3 Institute of Electrical and Electronics Engineers (IEEE) Standard:	
No. 142-1982	Recommended Practice for Grounding of Industrial and Commercial Power Systems
1.4 National Electrical Manufacturers Association (NEMA) Standards:	
ICS 1-1983	Industrial Control and Systems Incl Rev 1 thru 3
ICS 2-1983	Industrial Control Devices, Incl Rev 1 Controllers and Assemblies thru 5
ICS 3-1983	Industrial Systems Incl Rev 1 thru 3
ICS 4-1983	Terminal Blocks for Industrial Use

ICS 6-1983	Enclosures for Industrial Controls and Incl Rev 1 thru 3 Systems
RN 1-1986	Polyvinyl-Chloride (PVC) Externally Coated Rigid Steel Conduit and Intermediate Metal Conduit
TC 2-1983	Electrical Plastic Tubing (EPT) and Conduit (EPC40 and EPC-80)
VE 1-1984	Metallic Cable Tray Systems
1.5 National Fire Protection Association (NFPA) Publication:	
70-1996	National Electrical Code
1.6 Underwriters Laboratories Inc. (UL) Publications:	
Electrical Construction Materials Directory (May 1987)	
UL 6	Rigid Metal Conduit (Oct 23, 1981, 9th Ed.; Rev Oct 10, 1983; Errata Aug 29, 1986)
UL 20	General-Use Snap Switches (Jun 12, 1986, 10th Ed.; Errata, Rev thru Sep 23, 1986)
UL 50	Cabinets and Boxes (Apr 25, 1980, 8th Ed.; Rev thru May 18, 1987)
UL 57	Electric Lighting Fixtures (Aug 30, 1972, 12th Ed.; Errata Sep 23, 1975; Rev thru Jul 22, 1982)
UL 360	Liquid-Tight Flexible Steel Conduit (Aug 18, 1986, 3rd Ed.) (5)
UL 467	Grounding and Bonding Equipment (Nov 22, 1984, 6th Ed.; Rev Apr 30, 1985)
UL 498	Attachment Plugs and Receptacles (Nov 3, 1986, 11th Ed.; Rev thru Oct 22, 1987; Errata Jul 23, 1986)
UL 508	Industrial Control Equipment (Aug 17, 1984, 14th Ed.; Rev thru Feb 22, 1988)
UL 514A	Metallic Outlet Boxes (Dec 1, 1983, 7th Ed.; Rev thru Oct 27, 1987)
UL 797	Electrical Metallic Tubing (Oct 10, 1983, 5th Ed.)
UL 1242	Intermediate Metal Conduit (Oct 10, 1983, 1st Ed.)
UL 1570	Fluorescent Lighting Fixtures (Nov 22 1982, 2nd Ed.; Rev thru Jun 9, 1987)

2. GENERAL:

2.1 Rules: The installation shall conform to the requirements of NFPA 70, unless more stringent requirements are indicated herein or shown.

2.2 Coordination: The drawings indicate the extent and the general location and arrangement of equipment, conduit, and wiring. The Contractor shall become familiar with all details of the work and verify all dimensions in the field so that the outlets and equipment will be properly located and readily accessible. Lighting fixtures, outlets, and other equipment and materials shall be located to avoid interference with mechanical or structural features; otherwise, lighting fixtures shall be symmetrically located according to the room arrangement when uniform illumination is required, or asymmetrically located to suit conditions fixed by design and shown. If any conflicts occur necessitating departures from the drawings, details of and reasons for departures shall be submitted and approved prior to implementing any change.

2.3 Standard Products: Material and equipment shall be a standard product of a manufacturer regularly engaged in the manufacture of the product and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening.

2.4 Identification Nameplates: Major items of electrical equipment and major components shall be permanently marked with an identification name to identify the equipment by type or function and specific unit number as indicated. Unless otherwise specified, all identification nameplates shall be made of laminated plastic in accordance with Fed. Spec. IP-387 with black outer layers and a white core. Edges shall be chamfered. Plates shall be fastened with black finished round-head drive screws or approved nonadhesive metal fasteners. When the nameplate is to be installed on an irregular shaped object, the Contractor shall devise an approved support suitable for the application. In all instances, the nameplate shall be installed in a conspicuous location. At the option of the Contractor, the equipment manufacturer's standard embossed nameplate material with black painted letters may be furnished in lieu of laminated plastic. The following equipment, as a minimum, shall be provided with identification nameplates:

Minimum 1/4-Inch High
Letters

Minimum 1/8-Inch High
Letters

Panelboards

Control Power Transformers

Starters

Safety Switches

Control Devices (Relays, Contactors, Etc.)

Transformers

Equipment Enclosures

Constant Current Regulators

3. APPROVAL OF MATERIALS AND EQUIPMENT: Materials and equipment will be approved based on the manufacturer's published data.

3.1 Underwriters Laboratories Inc. (UL) Publications: The label or listing of the Underwriters Laboratories Inc., will be accepted as evidence that the materials or equipment conform to the applicable standards of that agency. In lieu of this label or listing, the Contractor shall submit a statement from a nationally recognized, adequately equipped testing agency indicating that the items have been tested in accordance with required procedures and that the materials and equipment comply with the contract requirements. However, materials and equipment installed in hazardous locations must bear the UL label unless the data submitted from other testing agency is specifically approved in writing by the Contracting Officer.

3.2 Non-Underwriters Laboratories Inc. (UL) Publications: For other than equipment and materials specified to conform to UL publications, a manufacturer's statement indicating complete compliance with the applicable Federal Specification, or standard of the American Society for Testing and Materials, National Electrical Manufacturers, or other commercial standard, is acceptable.

3.3 Shop Drawings: Shop drawings shall be submitted for approval in accordance with the SPECIAL CLAUSES and shall consist of a complete list of equipment and materials, including manufacturer's descriptive and technical data; catalog cuts; and any special installation instructions that may be required. Shop drawings shall be submitted for all materials and equipment specified. Drawings shall show applicable schematic diagrams; equipment layout and anchorage; and conduit and cable trays runs, anchorage, and support.

PART 2 - PRODUCTS AND EXECUTION

4. WORKMANSHIP: Materials and equipment shall be installed in accordance with recommendations of the manufacturer and as shown.

5. MATERIALS AND EQUIPMENT shall conform to the respective publications and other requirements specified below. Materials and equipment not listed below shall be as specified elsewhere in this section.

5.1 Fluorescent Lamp Ballast: High-power-factor type conforming to Fed. Spec. WB-30, Class P, automatic-resetting type.

5.2 Cables: Cables shall conform to Fed. Spec. JC-30 and shall be of annealed copper. Cables shall be single-conductor type, unless otherwise indicated.

5.2.1 Grounding Cables: Grounding cables shall be bare or shall have green low-voltage insulation.

5.3 Cabinets for Communications: UL 50.

5.4 Circuit Breakers:

5.4.1 Molded-Case and Insulated-Case Circuit Breakers: Fed. Spec. WC-375.

5.5 Conduit:

5.5.1 Flexible Steel Conduit: Fed. Spec. WWC-566 and UL 360.

5.5.2 Rigid Metal Conduit: UL 6.

5.5.3 PVC Coated Rigid Steel Conduit: NEMA RN 1.

5.5.4 Intermediate Metal Conduit: UL 1242.

5.5.5 Conduit Coatings:

5.5.5.1 Plastic Resin System: Fed. Spec. LC-530, Type I; or LP-1035, composition, type, class, and grade suitable for the purpose, thickness as required for the Type I system of Fed. Spec. LC-530; or NEMA RN 1, Type A40.

5.5.5.2 Epoxy System: Fed. Spec. LC-530, Type II.

5.6 Connectors, Wire Pressure: Fed. Spec. WS-610.

5.7 Device Plates: Fed. Spec. WP-455.

5.8 Fittings, Cable and Conduit: Fed. Spec. WF-406 and W-F-408.

5.9 Fixtures: Standard Drawings 4006-04 and UL 57, unless otherwise specified.

5.9.1 Fluorescent, Industrial Type Fixtures: Fed. Spec. WF-1234, modified as required for circuits specified, and UL 1570.

5.9.2 Fluorescent, General-Purpose Fixtures: Fed. Spec. W-F-414, Type II, style A, B, C and D, W-F-1662, and UL 1570.

5.10 Lamps:

5.10.1 Fluorescent Lamps: Fed. Spec. WL-116.

5.11 Outlets:

5.11.1 Conduit, Cast-Metal or Malleable Metal: Fed. Spec. WC-586.

5.12 Outlet Boxes:

5.12.1 Sheet-Steel Outlet Boxes: Fed. Spec. W-J-800.

5.12.2 Switch, Box, (Enclosed), Surface-mounted: UL 98.

5.13 Panelboards: Dead-front construction, Fed. Spec. WP-115.

5.13.1 Lighting and appliance power feeder, and distribution panelboards, Class 1, type as specified hereinafter.

5.14 Receptacles:

5.14.1 General Grade Receptacles: Fed. Spec. W-C-596.

5.14.2 Standard Grade Receptacles: UL 498.

5.15 Splice, Conductor: Fed. Spec. WS-610.

5.16 Switches:

5.16.1 Snap Switches: UL 20.

5.17 Tapes:

5.17.1 Friction Tape: ASTM D 69.

5.17.2 Plastic Tape: Fed. Spec. HHI-595.

5.17.3 Rubber Tape: Fed. Spec. HHI-553.

5.18 Tubing, Electrical, ZincCoated Steel (EMT): UL 797.

5.19 Grounding and Bonding Equipment: UL 467.

6. GROUNDING: Except where specifically indicated otherwise, all exposed noncurrent carrying metallic parts of electrical equipment, metallic raceway systems, and neutral conductor of the wiring system shall be grounded.

7. WIRING METHODS:

7.1 General Requirements: Unless otherwise indicated, wiring shall consist of insulated conductors installed in rigid zinc coated steel conduit, electrical metallic tubing, or intermediate metal conduit.

7.2 Conduit and Tubing Systems: Conduit and tubing systems shall be installed as indicated. Conduit sizes shown are based on conductor insulation types as described in paragraph WIRING METHODS. Minimum size of raceways shall be 1/2 inch. Electrical metallic tubing may be installed only within buildings. Electrical metallic tubing may be installed in concrete and grout in dry locations. Electrical metallic tubing installed in concrete or grout shall be provided with concrete tight fittings. EMT will not be installed in damp or wet locations. Except as otherwise specified, IMC may be used as an option for rigid steel conduit in areas as permitted by the NPA 70.

7.2.1 Installing Conductors and Conduit Below Slab-on-Grade or in the Ground: All electrical wiring below slab-on-grade shall be protected by a conduit system. Conduit passing vertically through slabs-on-grade shall be rigid steel or IMC. Rigid steel or IMC conduits installed below slab-on-grade or in the earth shall be field wrapped with 0.010-inch thick pipe wrapping plastic tape applied with a 50 percent overlay, or shall have a factory applied polyvinyl chloride, plastic resin, epoxy coating system.

7.2.2 Exposed Raceways: Exposed raceways shall be installed parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceilings.

7.2.3 Changes in Direction of Runs: Changes in direction of runs shall be made with symmetrical bends or cast-metal fittings. Field-made bends and offsets shall be made with an approved hickey or conduit-bending machine. Crushed or deformed raceways shall not be installed. Trapped raceways in damp and wet locations shall be avoided where possible. Care shall be taken to prevent the lodgment of plaster, dirt, or trash in raceways, boxes, fittings and equipment during the course of construction. Clogged raceways shall be entirely freed of obstructions or shall be replaced.

7.2.4 Supports: Raceways shall be securely and rigidly fastened in place at intervals of not more than 10 feet with approved pipe straps, wall brackets, conduit clamps, conduit hangers, threaded-clamps with retainers, or ceiling trapeze. Loads and supports shall be coordinated with supporting structure to prevent damage or deformation to the structures, but no load shall be applied to joist bridging. Fastenings shall be by wood screws to wood; by expansion bolts on concrete or brick; by machine screws, welded threaded studs, heat-treated or spring-steel-tension clamps on steel work. Holes cut to a depth of more than 1 1/2 inches in reinforced concrete beams or to a depth of more than 3/4 inch in concrete joists shall avoid cutting the main reinforcing bars. Holes not used shall be filled. In partitions of light steel construction, sheet-metal screws may be used. Conduit shall not be supported using wire or nylon ties. Raceways shall be installed as a complete system and be independently supported from the structure. Supporting means will not be shared between electrical raceways and mechanical piping or ducts. Conduits shall be fastened to all sheet-metal boxes and cabinets with two locknuts where required by the NFPA 70, where insulating bushings are used, and where bushings cannot be brought into firm contact with the box; otherwise, a single locknut and bushing may be used. Bushings shall be installed on the ends of all conduits and shall be of the insulating type where required by the NFPA 70. Threadless fittings for electrical metallic tubing shall be of a type approved for the conditions encountered. A pull wire shall be inserted in each empty raceway in which wiring is to be installed by others if the raceway is more than 50 feet in length and contains more than the equivalent of two 90 degree bends, or where the raceway is more than 150 feet in length. The pull wire shall be of No. 14 AWG zinc coated steel, or of plastic having not less than 200-pound tensile strength. Not less than 10 inches of slack shall be left at each end of the pull wire.

7.2.5 Exposed Lengths of Conduit Containing Voltages Over 600 Volts: Exposed lengths of conduit containing medium voltage series airfield lighting circuit conductors shall have two red bands 2 inches wide spaced 8 inches apart painted near each coupling; the intervening space between the red bands shall be painted white, and on the white space the words "HIGH VOLTAGE" voltage shall be stenciled in black:

7.3 Conductors: Conductors in raceways and cable trays shall be of copper. Wire connectors of insulating material or solderless pressure connectors properly taped shall be utilized for all splices where possible.

7.3.1 Sizes shall be not less than indicated. Branch circuit conductors shall be not smaller than No. 12 AWG. Conductors for branch circuits of 120 volts more than 100 feet long and of 277 volts more than 230 feet long, from panel to load, shall be No. 10 AWG. Class 1 remote control and signal circuit conductors shall be not less than No. 14 AWG. Class 2 remote control and signal circuit conductors shall be not less than No. 16 AWG.

7.3.2 The conductor sizes are based on the use of THW insulation for conductors, except where otherwise indicated. Other acceptable NFPA 70 types of insulated conductors of equivalent ampacity may be substituted.

7.3.3 Conductor identification of each phase shall be by color-coded insulation. The color of the insulation of the ungrounded conductors of different voltage systems shall be as follows:

120/208 volt, 3-phase: red, black, and blue. 277/480 volt, 3-phase: yellow, brown, and orange. 120/240 volt, single/phase: red and black.

Control circuit conductor identification shall be made by color-coded insulated conductors, plastic-coated self-sticking printed markers, permanently attached stamped metal foil markers, or equivalent means as approved. Conductor identification shall be provided within each enclosure where a tap, splice, or termination is made. Control circuit terminals of equipment shall be properly identified. Terminal and conductor identification shall match that shown on approved shop drawings. Hand lettering or marking is not acceptable. Where insulation of the required color is not available, electrical tape of the required color shall be half-lapped for the entire length within the indicated enclosures.

8. **BOXES AND SUPPORTS:** Boxes shall be provided in the wiring or raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures. Boxes for metallic raceways, 4-inch by 4-inch nominal size and smaller, shall be of the cast-metal hub type when located in normally wet locations, when surface mounted on outside of exterior surfaces, when located in hazardous areas, and when installed exposed up to 7 feet above interior floors and walkways. Large size boxes shall be NEMA 1, 3R, or as shown. Boxes in other locations shall be sheet steel. In partitions of light steel construction bar hangers with 1-inch long studs, mounted between metal wall studs or metal stud "C" brackets snapped on and tabbed to metal wall studs, shall be used to secure boxes to the building structure. When "C" brackets are used, additional box support shall be provided on the side of the box opposite the brackets. The edge of boxes for electrical devices shall be flush with the finished surfaces in stud wall installations with wallboard. Boxes for mounting lighting fixtures shall be not less than 4 inches square except that smaller boxes may be installed as required by fixture configuration, as approved. Boxes installed for concealed wiring shall be provided with suitable extension rings or plaster covers, as required. Indicated elevations are approximate. Unless otherwise indicated, boxes for wall switches shall be mounted 48 inches above finished floors. Cast-metal boxes installed in wet locations and boxes installed flush with the outside of exterior surfaces shall be gasketed. Boxes and supports shall be fastened to wood with wood screws or screw-type nails of equal holding strength, with bolts and metal expansion shields on concrete or brick, and with machine screws or welded studs on steel work. In open overhead spaces, cast-metal boxes threaded to raceways need not be separately supported except when used for fixture support; cast-metal boxes having threadless connectors and sheet metal boxes shall be supported directly from the building structure. Cast-metal boxes with 3/32-inch wall thickness are acceptable.

8.1 Boxes for Use with Raceway Systems: Boxes for use with raceway systems shall be not less than 1-1/2 inches deep except where shallower boxes required by structural conditions are approved. Sheetmetal boxes for other than lightingfixtures shall be not less than 4 inches square exceptthat 4- by 2-inch boxes may be used where only one raceway enters the outlet.

8.2 Pull Boxes: Pull boxes of not less than the minimum size required by the NFPA 70 shall be constructed of aluminum or galvanized sheet steel, except where castmetal boxes are required in locations specified above. Boxes shall be furnished with screwfastened covers. Where several feeders pass through a common pull box, the feeders shall be tagged to indicate clearly the electrical characteristics, circuit number, and paneldesignation.

9. DEVICE PLATES: Onepiece type device plates shall be provided for all outlets and fittings. Plates on unfinished walls and on fittings shall be of zinc-coated sheet steel, cast-metal, or impact resistant plastic having rounded or beveled edges. Plates on finished walls shall be of steel with baked enamel finish or impact resistant plastic and shall be brown. Screws shall be of metal with countersunk heads, in a color to match the finish of the plate. Plates shall be installed with allfour edges in continuous contact with finished wall surfaces without the use of mats or similar devices. Plaster fillings will not be permitted. Plates shall be installed with an alignment tolerance of 1/16inch. The use of sectional-type device plates will not be permitted. Plates installed in wet locations shall be gasketed and provided with a hinged, gasketed cover, unless otherwise specified.

10. RECEPTACLES:

10.1 Single and Duplex Receptacles: Single and duplex receptacles shall be rated 20amperes, 125 volts, two-pole, three-wire, grounding type with polarized parallel slots. Bodies shall be of brown phenolic compound supported by mounting strap having plaster ears. Contact arrangement shall be such that contact is made on two sides of aninserted blade. Receptacle shall be side or back-wired with two screws per terminal. The third grounding pole shall be connected to the metal mounting yoke.

11. WALL SWITCHES shall be of the totally enclosed tumbler type with bodies of phenolic compound. Handles shall be brown. Wiring terminals shall be of the screw type or of the solderless pressure type having suitable conductor-release arrangement. Not more than one switch shall be installed in a single-gang position. Switches shall be rated 20ampere 277-volt for use on alternating current only.

12. CIRCUIT BREAKERS shall have voltage, current, and interrupting ratings as indicated.

12.1 Molded-Case Circuit Breakers: Singlepole breakers shall be full module size; two poles shall not be installed in a single module. Multipole breakers shall be of the commontrip type having a single operating handle.

13. PANELBOARDS shall conform to Fed. Spec. WP-115. Circuit breakers and switches used as a motor disconnecting means and not in sight ofthe motor shall be capable of being locked in the open position. Door locks shall be keyed alike. Nameplates shall be as approved. Directories shall be typed to indicate loads served by each circuit and mounted in a holder behind a clear protective covering.

13.1 Panelboards: Panelboards shall be circuit breaker equipped, Type I, Class 1. Panelboards shall not exceed 78 inches in height and shall be so mounted that the height of the top operating handle will not exceed 6 feet 6 inches from the floor.

14. CABINETS: Communications systems cabinets shall have boxes constructed of zinc-coated sheet steel. Cabinets shall be constructed with interior dimensions not less than those indicated. Trim shall be fitted with hinged door and flush catch. Doors shall provide maximum-size openings to the box interiors. Boxes shall be provided with a 5/8-inch plywood backboard having a two-coat insulating varnish finish.

15. LAMPS AND LIGHTING FIXTURES: Fixtures may be provided with No. 18 AWG stranded copper conductors in 3/8-inch flexible metal conduits not over 6 feet long where flexible metal conduits are permitted by NFPA 70. Ballasted fixtures shall have ballasts which are compatible with the specific type and rating of lamps indicated and shall comply with the applicable provisions of the publications referenced.

15.1 Lamps: Lamps of the type, wattage, and voltage rating indicated shall be delivered to the project in the original cartons and installed in the fixtures just prior to the completion of the project.

15.1.1 Fluorescent lamps shall have standard coolwhite color characteristics and shall be of a type that will not require starter switches. Lamps shall be of the rapid-start type unless otherwise shown or approved.

15.2 Fixtures: Fixtures shall be as shown on the drawings and shall conform to the following specifications and shall be as shown on the drawings.

15.2.1 Accessories such as straps, mounting plates, nipples, or brackets shall be provided for proper installation.

15.2.2 Ceiling fixtures shall be coordinated with and suitable for installation on the ceiling indicated. Installation and support of fixtures shall be in accordance with the NFPA 70 and manufacturer's recommendations. Surface-mounted fixtures shall be suitable for fastening to the surface(s) indicated.

15.2.3 Sockets of industrial, strip, and other open type fluorescent fixtures shall be of the type requiring a forced movement along the longitudinal axis of the lamp for insertion and removal of the lamp.

16. EQUIPMENT CONNECTIONS: All wiring not furnished and installed under other sections of the specifications for the connection of electrical equipment as indicated on the drawings shall be furnished and installed under this section of the specifications. Connections shall comply with the applicable requirements of paragraph WIRING METHODS. Flexible conduits 6 feet or less in length shall be provided to all electrical equipment subject to periodic removal, vibration, or movement and for all motors. Liquid-tight conduits shall be used in damp or wet locations.

17. PAINTING AND FINISHING: Field-applied paint on exposed surfaces shall be provided under SECTION 9A, PAINTING, GENERAL.

18. REPAIR OF EXISTING WORK: The work shall be carefully laid out in advance and where cutting, channeling, chasing, or drilling of floors, walls, partitions, ceiling, or other surfaces is necessary for the

proper installation, support, or anchorage of the conduit, raceways, or other electrical work, this work shall be carefully done, and any damage to building, piping, or equipment shall be repaired by skilled mechanics of the trades involved, at no additional cost to the Government.

19. TESTS: After the interior wiring-system installation is completed, and at such time as the Contracting Officer may direct, the Contractor shall conduct an operating test for approval. The equipment shall be demonstrated to operate in accordance with the requirements of this specification. The test shall be performed in the presence of the Contracting Officer. The Contractor shall furnish all instruments and personnel required for the tests, and the Government will furnish the necessary electric power. No part of the electrical distribution system shall be energized prior to the resistance testing of that systems ground rods and submission of test results to the Contracting Officer. Test reports shall indicate the location of the rod and the resistance and the soil conditions at the time the test was performed.

END OF SECTION

SECTION 16C

AIRFIELD LIGHTING AND VISUAL NAVIGATION AIDS

PART 1 GENERAL

Existing airfield lighting systems shall remain in operating condition except for minimum interruptions, as approved in writing by the Contracting Officer. Prior to each interruption, all necessary materials and a sufficient labor force shall be assembled to permit completing the work within the scheduled time interval. Under no circumstances shall any of the existing airfield or heliport lighting circuits be left inoperative without making provisions for suitable temporary connections in the affected area or areas. All airfield lighting circuits covered under this contract shall be restored in such a manner that they will be operational at dusk each day. The Contractor shall submit a plan for outages and maintaining lighting and lighting control.

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C2	(1993) National Electrical Safety Code
ANSI C119.1	(1986) Sealed Insulated Underground Connector Systems Rated 600 Volts

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 123	(1989a) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 153	(1996) Zinc Coating (Hot Dip) on Iron and Steel Hardware
ASTM A 780	(1993a) Repair of Damaged and Uncoated areas of Hot-Dipped Galvanized Coatings
ASTM B 117	(1994) Operating Salt Spray (Fog) Testing Apparatus
ASTM D 709	(1992) Laminated Thermosetting Materials

ASTM D 1248	(1984; R 1989) Polyethylene Plastics Molding and Extrusion Materials
ASTM D 1654	(1992) Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
ASSOCIATION OF EDISON ILLUMINATING COMPANIES (AEIC)	
AEIC CS5	(1994) Specification for Crosslinked-Polyethylene Insulated Shielded Power Cables Rated 5 Through 46 kV
FACTORY MUTUAL ENGINEERING AND RESEARCH (FM)	
FM P7825	(1995; Supple I; Supple II; Supple III) Approval Guide
FEDERAL AVIATION ADMINISTRATION (FAA)	
FAA AC 150/5345-3	(Rev D) L-821 Panels for Remote Control of Airport Lighting
FAA AC 150/5345-7	(Rev D; Change 1) L-824 Underground Electrical Cable for Airport Lighting Circuits
FAA AC 150/5345-13	(Rev A) L-841 Auxiliary Relay Cabinet Assembly for Pilot Control of Airport Lighting Circuits
FAA AC 150/5345-26	(Rev B; Changes 1 & 2) L-823 Plug and Receptacle, Cable Connectors
FAA AC 150/5345-27	(Rev C) Wind Cone Assemblies
FAA AC 150/5345-42	(Rev C; Change 1) Airport Light Bases, Transformer Houses, Junction Boxes and Accessories
FAA AC 150/5345-44	(Rev F; Change 1) Taxiway and Runway Signs

FAA AC 150/5345-46	(Rev A) Runway and Taxiway Light Fixtures
FAA AC 150/5345-47	(Rev A) Isolation Transformers for Airport Lighting Systems
FAA AC 150/5370-10	(Rev A; Change 1 thru 6) Standards for Specifying Construction of Airports
FAA C-6046	(1978) Frangible Coupling Type I and Type 1A, Details
INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)	
IEEE C62.41	(1991) Surge Voltages in Low-Voltage AC Power Circuits
IEEE STD 48	(1990) Standard Test Procedures and Requirements for High-Voltage Alternating-Current Cable Terminations
NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)	
NEMA 250	(1991) Enclosures for Electrical Equipment (1000 volts Maximum)
NEMA ICS 2	(1993) Industrial Control Devices, Controller and Assemblies
NEMA ICS 6	(1993) Enclosures for Industrial Control and Systems
NEMA LA 1	(1992) Surge Arresters
NEMA PB 1	(1990) Panelboards
NEMA RN 1	(1989) Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel

Conduit	Conduit and Intermediate Metal Conduit
NEMA TC 2	(1990) Electrical Polyvinyl Chloride (PVC) Tubing (EPT) and Conduit (EPC-40 and EPC-80)
NEMA TC 3	(1990) PVC Fittings for Use with Rigid PVC Conduit and Tubing
NEMA TC 6	(1990) PVC and ABS Plastic Utilities Duct for Underground Installation

NEMA WC 7	(1993) Cross-Linked-Thermosetting-Polyethylene-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)	
NFPA 70	(1996) National Electrical Code
STEEL STRUCTURES PAINTING COUNCIL (SSPC)	
SSPC Paint 20	(1991) Zinc-Rich Primers (Type I - Inorganic and Type II - Organic)
UNDERWRITERS LABORATORIES (UL)	
UL-03	(1995; Supple) Electrical Construction Materials Directory
UL 1	(1993; Rev thru Jan 1995) Flexible Metal Conduit
UL 6	(1993) Rigid Metal Conduit
UL 44	(1991; Rev thru Feb 1996) Rubber-Insulated Wires and Cables
UL 83	(1991; Rev thru Mar 1996) Thermoplastic-Insulated Wires and Cables
UL 360	(1986; Rev thru Dec 1995) Liquid-Tight Flexible Steel Conduit
UL 486A	(1991; Rev Oct 1991) Wire Connectors and Soldering Lugs for Use with Copper Conductors
UL 510	(1994) Insulating Tape
UL 514A	(1991; Rev Apr 1995) Metallic Outlet Boxes

UL 797 (1993; Rev May 1995) Electrical
Metallic Tubing

UL 1242 (1983; Rev thru Jul 1993)
Intermediate Metal Conduit

1.2 GENERAL REQUIREMENTS

Items of the same classification shall be identical including equipment, assemblies, parts, and components.

1.2.1 Code Compliance

The installation shall comply with the requirements and recommendations of NFPA 70 and ANSI C2 and local codes where required.

1.2.2 Standard Product

Material and equipment shall be a standard product of a manufacturer regularly engaged in the manufacture of the product and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening.

1.2.3 Prevention of Corrosion

1.2.3.1 Metallic Materials

Metallic materials shall be protected against corrosion as specified. Aluminum shall not be used in contact with earth or concrete. Where aluminum conductors are connected to dissimilar metal, fittings conforming to UL 486B shall be used.

1.2.3.2 Ferrous Metal Hardware

Ferrous metal hardware shall be hot-dip galvanized in accordance with ASTM A 123 and ASTM A 153.

1.2.3.3 Luminaires Fabricated from Ferrous Metals

Luminaires fabricated from ferrous metals, unless hot-dip galvanized or of porcelain enamel finish shall be factory finished with a weather-resistant finish in accordance with paragraphs FACTORY COATING and FINISHING, except exposure shall be 200 hours. Finish color shall be the manufacturer's standard, unless otherwise indicated.

1.2.4 Unusual Service Conditions

Items furnished under this section shall be specifically suitable for the following unusual service conditions:

1.2.4.1 Altitude

Any equipment shall be suitable for operation up to an altitude of 10,000 feet.

1.2.4.2 Other

Material or equipment to be installed underground; in handholes, manholes, or underground vaults; or in light bases, shall be suitable for submerged operation.

1.2.5 Verification of Dimensions

The Contractor shall become familiar with details of the work, verify dimensions in the field, and advise the Contracting Officer of any discrepancy before performing any work.

1.3 SYSTEM DESCRIPTION

The airfield lighting and visual navigation aids shall consist of airfield lighting, airfield marking, wind direction indicator, runway lights, taxiway lights runway distance markers, taxiway signs and the lighting power supply and control.

1.4 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 1A, GENERAL.

1.4.1 Data

Materials and Equipment; GA.

A complete itemized listing of equipment and materials proposed for incorporation into the work. Each itemization shall include an item number, the quantity of items proposed, and the name of the manufacturer. Data composed of catalog cuts, brochures, circulars, specifications and product data, and printed information in sufficient detail and scope to verify compliance with requirements of the contract documents.

Protection Plan; GA.

Detailed procedures to prevent damage to existing facilities or infrastructures. If damage does occur, the procedures shall address repair and replacement of damaged property at the Contractor's expense.

Training; FIO.

Information describing training to be provided, training aids to be used, samples of training materials to be provided, and schedules of training, weeks before training is scheduled to begin.

Special Tools; FIO.

List of special tools and test equipment required for maintenance and testing of the products supplied by the Contractor.

Parts List; FIO.

A list of parts and components for the system by manufacturer's name, part number, nomenclature, and stock level required for maintenance and repair necessary to ensure continued operation with minimal delays.

1.4.2 Drawings

Lighting and Navigation Aids; GA.

Coordination drawings consisting of composite drawings showing coordination of work of one trade with that of other trades and with the structural and architectural elements of the work. Drawings shall be in sufficient detail to show overall dimensions of related items, clearances, and relative locations of work in allotted spaces. Drawings shall indicate where conflicts or clearance problems exist between the various trades.

As-Built Drawings; GA.

Drawings that provide current factual information including deviations from, and amendments to the drawings and changes in the work, concealed and visible, shall be provided as instructed. The as-built drawings shall show installations with respect to fixed installations not associated with the systems specified herein. Cable and wire shall be accurately identified and shall locate the connection and routing to and away from bases, housings, and boxes.

1.4.3 Instructions

Repair Requirements; FIO.

Instructions necessary to check out, troubleshoot, repair, and replace components of the systems, including integrated electrical and mechanical schematics and diagrams and diagnostic techniques necessary to enable operation and troubleshooting after acceptance of the system shall be provided.

Posted Instructions; GA.

A typed copy of the proposed posted instructions showing wiring, control diagrams, complete layout and operating instructions explaining preventive maintenance procedures, methods of checking the system for normal safe operation, and procedures for safely starting and stopping the system. Proposed diagrams, instructions, and other sheets shall be submitted prior to posting.

1.4.4 Reports

Test Results; GA.

Upon completion and testing of the installed system, performance test reports are required in booklet form showing all field tests performed to adjust each component and all field tests performed to provide compliance with the specified performance criteria. Each test shall indicate the final position of controls.

Field test reports shall be written, signed and provided as each circuit or installation item is completed. Field tests shall include resistance-to-ground and resistance between conductors, and continuity measurements for each circuit. For each series circuit the input voltage and output current of the constant current regulator at each intensity shall be measured. A visual inspection of the lights operation, or of the markings appearance, or of the installation of fixtures or units installed shall be reported.

Inspection; GA.

Inspection reports shall be prepared and provided as each stage of installation is completed. These reports shall identify the activity by contract number, location, quantity of material placed, and compliance with requirements.

Certificates

Qualifications; GA.

Certifications, when specified or required, including Certification of the Qualifications of Medium-Voltage Cable Installers, Certified Factory and Field Test Reports, and Certificates of Compliance submitted in lieu of other proofs of compliance with these contract provisions. A certification that contains the names and the qualifications of persons recommended to perform the splicing and termination of medium-voltage cables approved for installation under this contract shall be included. The certification shall indicate that any person recommended to perform actual splicing and termination has been adequately trained in the proper techniques and has had at least 3 recent years of experience in splicing and terminating the same or similar types of cables approved for installation. Any person recommended by the Contractor may be required to perform a dummy or practice splice and termination, in the presence of the Contracting Officer, before being approved as a qualified installer of medium-voltage cables. If that

additional requirement is imposed, the Contractor shall provide short sections of the approved types of cables with the approved type of splice and termination kits, and detailed manufacturer's instruction for the proper splicing and termination of the approved cable types. The certification shall be prepared in conformance with paragraph CERTIFICATES OF COMPLIANCE in the SPECIAL CONTRACT REQUIREMENTS, and shall be accompanied by satisfactory proof of the training and experience of persons recommended by the Contractor as cable installers.

Materials and Equipment; GA.

When equipment or materials are specified to conform to the standards or publications and requirements of AASHTO, ANSI, ASTM, AEIC, FM, IEEE, IES, NEMA, NFPA, or UL, or to an FAA, FS, or MS, proof that the items furnished under this section of the specifications conform to the specified requirements shall be included. The label or listing in UL-03 or in FM P7825 or the manufacturer's certification or published catalog specification data statement that the items comply with applicable specifications, standards, or publications and with the manufacturer's standards will be acceptable evidence of such compliance. Certificates shall be prepared by the manufacturer when the manufacturer's published data or drawings do not indicate conformance with other requirements of these specifications.

1.4.5 Operation and Maintenance Manuals

Equipment; GA.

Six copies of operation and six copies of maintenance manuals for the equipment furnished. One complete set shall be furnished prior to performance testing and the remainder shall be furnished upon acceptance. Operating manuals shall detail the step-by-step procedures required for system startup, operation, and shutdown. Operating manuals shall include the manufacturer's name, model number, parts list, and brief description of all equipment and their basic operating features. Maintenance manuals shall list routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides. Maintenance manuals shall include conduit and equipment layout and simplified wiring and control diagrams of the system as installed.

PART 2 PRODUCTS

2.1 MATERIALS

Equipment and materials shall be new unless indicated or specified otherwise. Materials and equipment shall be labelled when approved by Underwriters Laboratories (UL) or Factory Mutual (FM) System. Askarel and insulating liquids containing polychlorinated biphenyls (PCB's) will not be allowed in any equipment. Equipment installed below grade in vaults, manholes, and handholes shall be the submersible type.

2.1.1 Electrical Tape

Electrical tape shall be UL 510 plastic insulating tape.

2.1.2 Nameplates

Each major component of equipment shall have as a minimum the manufacturer's name, address, and catalog or style number on a nameplate securely attached to the item of equipment. Laminated plastic nameplates shall be provided for equipment, controls, and devices to identify function, and where applicable, position. Nameplates shall be 1/8 inch thick laminated cellulose paper base phenolic resin plastic conforming to ASTM D 709 sheet type, grade ES-3, white with black center core. Surface shall be a matte finish with square corners. Lettering shall be engraved into the black core. Size of nameplates shall be 1 by 2-1/2 inches minimum with minimum 1/4 inch high normal block lettering. Nameplates provided as indicated. Nameplates shall be fastened to the device with a minimum of two sheet metal screws or two rivets.

2.1.3 Conduit, Conduit Fittings, and Boxes

2.1.3.1 Rigid Steel or Intermediate Metal Conduit (IMC) and Fittings

The metal conduit and fittings shall be UL 6 and UL 1242, respectively, coated with a polyvinylchloride (PVC) sheath bonded to the galvanized exterior surface, nominal 40 mils thick, conforming to NEMA RN 1.

2.1.3.2 Flexible Metal Conduit

Flexible metal conduit shall be UL 1, zinc-coated steel. UL 360 liquid-tight flexible metal conduit shall be used in wet locations.

2.1.3.3 Outlet Boxes for Use with Steel Conduit, Rigid or Flexible

These outlet boxes shall be UL 514A, cast metal with gasket closures.

2.1.3.4 Plastic Duct for Concrete Encased Burial

These ducts shall be as specified in Section 16A, ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND.

2.1.3.5 Frangible Couplings and Adapters

These frangible couplings shall be in accordance with FAA C-6046. Upper section of frangible coupling shall be provided with one of the following:

- a. Unthreaded for slip-fitter connections.
- b. 2-13/32 inch 16N-1A modified thread for nut and compression ring to secure 2 inch EMT.

- c. 2 inch 11-1/2-N.P.T. (tapered) with 7/32 inch nominal wall thickness to accept rigid conduit coupling.
- d. Frangible Couplings for specialized applications as approved.
- e. Electrical Metallic Tubing UL 797, where indicated for use with frangible couplings and adapters.

2.1.4 Wire and Cable

Conductors shall be copper.

2.1.4.1 Conductor Sizes

Conductor size shall conform to American Wire Gage (AWG). Conductor sizes larger than No. 8 AWG shall be stranded. No. 8 AWG and smaller may be solid or stranded unless otherwise indicated.

2.1.4.2 Low Voltage Wire and Cable

UL 854, Type USE, 600 volts shall be used for underground low voltage power cables.

2.1.4.3 Wire and Cable for Airfield and Heliport Lighting Systems

- a. Airfield and heliport lighting cable shall be FAA AC 150/5345-7, Type L-824 for [crosslinked polyethylene Type C 5000-volt cable. Series airfield and heliport lighting cable shall be unshielded.

- b. Counterpoise Wire. No. 4 AWG bare stranded copper, annealed or soft drawn.

- d. Control Cable. Multiconductor type FAA AC 150/5345-7, Type A, B, or C for 120 volt AC control, rated 600 volts, No. 12 AWG, and conforming to the following unless indicated otherwise. Conductors shall be color coded. The cable shall have an overall jacket of heavy-duty neoprene rated for direct burial. NEMA WC 7 for crosslinked polyethylene insulation. For 48 volt DC control, multi-conductor, 300 volts, No. 19 AWG cable shall be in accordance with REA PE-39.

2.1.4.5 Cable Tags

Cable tags for each cable or wire shall be installed at duct entrances entering or leaving manholes, handholes, and at each terminal within the lighting vault. Cable tags shall be stainless steel, bronze, lead strap, or copper strip, approximately 1/16 inch thick or hard plastic 1/8 inch thick suitable for immersion in salt water and impervious to petroleum products and shall be of sufficient length for imprinting the legend on one line using raised letters. Cable tags shall be

permanently marked or stamped with letters not less than 1/4 inch in height as indicated. Two-color laminated plastic is acceptable. Plastic tags shall be dark colored with markings of light color to provide contrast so that identification can be easily read. Fastening material shall be of a type that will not deteriorate when exposed to water with a high saline content and to petroleum products.

2.1.5 Ground Rods

Ground rods shall be sectional copper-clad steel with diameter adequate to permit driving to full length of the rod, but not less than 3/4 inch in diameter and not more than 3.048 meters 10 feet long, unless indicated otherwise.

2.1.6 Surge Protection

Surge protection shall be metal oxide varistors (MOV) in accordance with NEMA LA 1 for power and signal circuits with ratings as recommended by the system manufacturer.

2.1.7 Cable Connectors and Splices

Cable connectors in accordance with FAA AC 150/5345-26, Item L-823 shall be used for connections and splices appropriate for the type of cable. Other types of cable connectors and splices shall be of copper alloys for copper conductors, aluminum alloys for aluminum-composition conductors and a type designed to minimize galvanic corrosion for copper to aluminum-composition conductors. For FAA Type L-824 lighting cable, connectors shall be FAA AC 150/5345-26, Type L-823.

2.1.8 Transformers

2.1.8.1 Encapsulated Isolation Transformers

These transformers shall be FAA AC 150/5345-47, Type L-830. Each transformer shall be provided with rating as shown on the contract drawings.

2.1.9 Light Bases

Light bases shall be FAA AC 150/5345-42 Type L-868 for lights and L-869 for junction boxes. Steel bases, Class 1, Size B shall be provided as indicated or as required to accommodate the fixture or device installed thereon if diameter is not shown.

2.1.9.1 Accessories

Base plates, cover plates, and adapter plates shall be provided to accommodate various sizes of fixtures. Bolts shall be stainless steel.

2.1.10 Sealant for Fixtures and Wires in Drilled Holes

The sealant shall be in accordance with FAA AC 150/5370-10, Type P-606. Use FAA AC 150/5370-10, Type P-606 sealant for use in asphaltic concrete (AC) or Portland cement concrete (PCC) pavement compatible with AC pavement and having a minimum elongation of 50 percent. Formulations of Type P-606 which are compatible with PCC pavement only are prohibited.

2.1.11 Constant Current Regulator

The regulator shall be FAA AC 150/5345-10, Type L-828, without monitoring system and with ratings as indicated.

2.1.11.1 Regulator Options

Regulators shall operate on 60 Hz, have internal primary switch included, have input voltage of 240 and be controlled by 120-volt external control voltage. Five brightness steps shall be provided.

2.1.12 Lamps and Filters

Lamps shall be of size and type indicated, or as required by fixture manufacturer for each lighting fixture required under this contract. Filters shall be of colors as indicated and conforming to the specification for the light concerned or to the standard referenced.

2.1.13 Pilot Relay Panel

The pilot relay panel shall be NEMA 250, NEMA ICS 2, and NEMA PB 1 for 120-volt control systems; and FAA AC 150/5345-13, Type L-841, for 48-V dc control systems.

2.1.14 Control Panel

The panel shall be FAA AC 150/5345-3, Type L-821 Class 1, Style. Quantity and color of lenses shall conform to FAA AC 150/5345-3 and shall correspond to the actual circuits indicated.

2.1.15 Lighting Fixtures

The lighting fixtures for the airfield lighting shall be as shown in the contract drawings or as required in other contract documents.

2.1.16 Painting

As specified in Section 9C, PAINTING, GENERAL and Section 2E, PAVEMENT MARKINGS.

2.2 AIRFIELD MARKINGS

The airfield and heliport markings shall be installed as shown on the contract drawings.

~~2.3 WIND DIRECTION INDICATOR~~

~~The wind direction indicator shall be an FAA AC 150/5345-27, Type L-806, low mass supporting structure, Style I-lighted, Size 2-12 feet. The wind cones shall be of the size and color as shown on the contract drawings.~~

2.4 RUNWAY LIGHTING SYSTEM

~~Runway lights include runway edge lights, runway distance and markers, controls, and the associated equipment and interconnecting wiring to provide complete systems as indicated and specified herein. In pavement light fixtures shall be able to withstand a minimum static single wheel load of 50,000 pounds.~~

2.4.1 Runway Edge Lights

~~The runway edge light fixtures shall meet the requirements of FAA AC 150/5345-46, Type L-862, elevated high-intensity Type L-850C, semiflush, high-intensity white lights.~~

2.4.2 Runway Distance Markers

~~Runway distance markers shall conform to FAA AC 150/5345-44, Type L-858B, Size 4, Style 3 with white numerals on a black background. Markers shall be provided, to withstand a static wind load of 0.28 pound per square inch, and suitable for connection to the secondary of the isolation transformers specified. Internally illuminated markers shall be provided with illumination of the face not less than 50 percent of that at rated current when the series lighting circuit is operated at the lowest brightness step. Marker housing shall be fiber reinforced epoxy, with information faces of high-impact acrylic or ultraviolet stabilized polycarbonate. The power supply and lamps shall be Style 3, Class 1.~~

2.5 TAXIWAY LIGHTING SYSTEMS

Taxiway lighting systems shall include edge lights, and guidance signs. These systems shall also include the associated equipment, power supplies and controls, mounting devices, and interconnecting wiring to provide complete systems as specified.

2.5.1 Taxiway Edge Lights

Taxiway edge light shall emit aviation blue light provided by filters or globes for both airfields and heliports. The edge lights shall meet the requirements of FAA AC 150/5345-46, Type L-852E, semiflush, lights.

2.5.2 Taxiway Guidance Signs

The taxiway guidance signs shall meet the requirements of FAA AC 150/5345-44, Type L-858Y for information. The size and information on the signs shall be as shown on contract drawings. The power supply to connect to series circuits shall be as indicated on the contract drawings.

2.6 FACTORY COATINGS

Equipment and component items, including but not limited to transformer stations and ferrous metal luminaries not hot-dip galvanized or porcelain enamel finish shall be provided with corrosion-resistant finishes which shall withstand 200 hours of exposure to the salt spray test specified in ASTM B 117 without loss of paint or release of adhesion of the paint primer coat to the metal surface in excess of 1/16 inch from the test mark. The scribed test mark and test evaluation shall be in accordance with ASTM D 1654 with a rating of not less than 7 in accordance with TABLE 1, (Procedure A). Cut edges or otherwise damaged surfaces of hot-dip galvanized sheet steel or mill galvanized sheet steel shall be coated with zinc rich paint conforming to SSPC Paint 20 in accordance with ASTM A 780.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

Circuits installed underground shall conform to the requirements of Section 16A, ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND, except as required herein. Steel conduits installed underground shall be installed and protected from corrosion in conformance with the requirements of Section 16B, ELECTRICAL WORK, INTERIOR. Except as covered herein, excavation, trenching, and backfilling shall conform to the requirements of Section 2B, EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS. Concrete work shall conform to the requirements of Section 3A, CONCRETE FOR BUILDING CONSTRUCTION.

3.2 CABLES, GENERAL REQUIREMENTS

The type of installation, size and number of cables shall be as indicated. Conductors larger than No. 8 AWG shall be stranded. Loads shall be divided as evenly as practicable on the various phases of the system. Manufacturer's written recommendations shall be furnished for each type of splice and medium-voltage cable joint and termination, and shall be approved before any work is done. Medium-voltage cable joints and terminations shall be the standard product of a manufacturer and shall be either of the factory preformed type or of the kit type containing tapes and other required parts. Medium-voltage cable joints shall be made by qualified cable splicers.

Compounds and tapes shall be electrical grade suitable for the cable insulation provided and shall use design materials and techniques recommended by the manufacturer. Maximum length of cable pull and cable pulling tensions shall not exceed the cable manufacturer's recommendations.

3.2.1 Duct Line Installation

Cables shall be installed in duct lines. Cable splices in low-voltage cables shall be made in manholes, pullboxes, and handholes only, except as otherwise noted. Neutral and ground conductors shall be installed in the same duct with their associated phase conductors. Counterpoise cable shall be installed in a separate duct or direct-burial not less than 6 inches above the uppermost duct containing electrical cable. Electrical metallic tubing shall not be installed underground or enclosed in concrete.

3.3 MEDIUM-VOLTAGE CABLES

Medium-voltage cables shall be suitable for a rated circuit voltage of 5 kV. Other parts of the cable system such as joints and terminations shall have ratings not less than the rating of the cables on which they are installed. Separable insulated connectors shall have nominal voltage ratings coordinated to associated apparatus ratings rather than cable ratings when used to connect cable to apparatus. Cables shall be provided with 100 percent insulation level. Neutral conductors of grounded neutral systems shall be of the same insulation material as phase conductors, except that a 600-volt insulation rating is acceptable.

3.3.1 Types

Separable insulated connectors of suitable construction or standard splice kits shall be used for single-conductor and two-conductor cables. The connectors shall be of FAA AC 150/5345-26 type.

3.3.1.1 Requirements

Cable joints shall provide insulation and jacket equivalent to that of the associated cable.

3.4 LOW-VOLTAGE CABLES

Cable shall be rated 600 volts. Other parts of cable systems such as splices and terminations shall be rated at not less than 600 volts. Splices in wires No. 10 AWG and smaller shall be made with an insulated, solderless, pressure type connector, conforming to the applicable requirements of UL 486A. Splices in wires No. 8 AWG single conductor cable shall be made with connectors, noninsulated, solderless, pressure type connector, conforming to the applicable requirements of UL 486A and UL 486B. They shall then be covered with an insulation and jacket material equivalent to the conductor insulation and jacket.] Splices below grade or in wet locations shall be sealed type conforming to ANSI C119.1 or shall be waterproofed by a sealant-filled, thick wall, heat shrinkable, thermosetting tubing or by pouring a thermosetting resin into a mold that surrounds the joined conductors.

3.5 DUCT LINES

Duct lines shall be as specified in Section 16A, ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND.

3.6 MANHOLES AND HANDHOLES

The manholes and handholes shall be as specified in Section 16A, ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND.

3.7 CABLE MARKERS

Cable markers or tags shall be provided for each cable at duct entrances entering or leaving manholes or handholes and at each termination within the lighting vault. Cables in each manhole or handhole shall have not less than two tags per cable, one near each duct entrance hole. Immediately after cable installation, tags shall be permanently attached to cables and wires so that they cannot be accidentally detached.

3.8 FRANGIBLE REQUIREMENTS

Frangible supports, couplings, and adapters shall be installed as indicated or specified.

3.9 ELEVATED AIRFIELD LIGHTS

Elevated lights shall be frangibly mounted, not to exceed 14 inches in height shall be except where higher mounting is permitted in snow accumulation areas. Equipment exceeding 14 inches in height shall be frangibly mounted as indicated.

3.10 SEMIFLUSH AIRFIELD LIGHTS

Water, debris, and other foreign substances shall be removed prior to installing semiflush light base and light. Positioning jigs shall be used to hold the light bases and/or lights to ensure

correct orientation and leveling until the concrete, adhesive, or sealant can provide permanent support.

3.11 FIXTURE INSTALLATION

3.11.1 Lighting Fixture Installation

A jig or holding device shall be used when installing each light fixture to ensure positioning to the proper elevation, alignment, level control, and azimuth control. Light fixture shall be oriented with the light beams parallel to the runway or taxiway centerline and facing in the required direction. Outermost edge of fixture shall be level with the surrounding pavement.

3.12 SPLICES FOR AIRFIELD AND HELIPORT LIGHTING CABLE

3.12.1 Connectors

Kit type connectors shall be used to splice 5 kV single-conductor series lighting cables. During installation mating surfaces of connectors shall be covered until connected and clean when plugged together. At joint where connectors come together, heat shrinkable tubing shall be installed with waterproof sealant with two half-lapped layers of tape over the entire joint. Joint shall prevent entrapment of air which might subsequently loosen the joint.

3.13 GROUNDING SYSTEMS

3.13.1 Counterpoise Installation

Counterpoise wire shall be laid for entire length of circuits supplying airfield lighting. Wire shall be in one piece, except where distance exceeds the length usually supplied. Counterpoise shall be installed on top of the envelope of concrete-encased duct. Where trenches or duct lines intersect, counterpoise wires shall be electrically interconnected by exothermic welding or brazing. A counterpoise to earth ground shall be provided by means of a driven ground at every 2000 feet of cable run. The counterpoise system shall be connected to the vault grounding system at one point.

All counterpoise connections to ground rods or grounding conductors shall be by exothermic welding or brazing.

3.13.2 Fixture Grounding

Connect the counterpoise to the metal base (or metallic mounting structure) of each light fixture. The connection from the counterpoise to the metal base shall be by a #6 AWG bare stranded copper jumper. Exothermic welds or brazing shall be used for all jumper connections to the counterpoise.

3.14 WIND DIRECTION INDICATORS

Installation shall include a black circle constructed on the ground with center at center of the base. Circle shall be constructed using an emulsified asphalt-sand mixture or of a cut-back asphalt-sand mixture not less than 5 inches in thickness. Asphalt-sand mixture shall contain not less than 6 percent bitumen. Sand shall be well-graded with not more than 10 percent material which will pass through a No. 200 mesh sieve. Asphalt-sand mixture shall be compacted thoroughly and sloped for drainage from center to outer rim from one side to the other. The wind cone illumination lights and obstruction lights shall be energized from series circuits as shown by the contract drawings or as required otherwise.

3.15 ISOLATION TRANSFORMERS

Transformer lead connections shall conform to FAA AC 150/5345-26. Transformer secondary connectors shall plug directly into a mating connector on the transformer secondary leads. During installation, mating surfaces of connectors shall be covered until connected and clean when plugged together. At joint where connectors come together, heat shrinkable tubing shall be installed with waterproof sealant or with two half-lapped layers of tape over the entire joint. Joint shall prevent entrapment of air which might subsequently loosen the joint.

3.16 ~~RUNWAY AND TAXIWAY LIGHTING SYSTEMS~~

3.16.1 ~~Runway and Taxiway~~ Edge Lights

Edge lights shall be elevated type lights where indicated on the contract drawings and shall be semiflush type where indicated on the contract drawings. Elevated lights shall be frangibly mounted and each light supplied power through an isolation transformer. The taxiway lights shall be omnidirectional and only require leveling. ~~The runway lights require leveling and alignment of the beams for the correct toe in of the beams.~~

3.17 FIELD QUALITY CONTROL

The Contracting Officer shall be notified five working days prior to each test. Deficiencies found shall be corrected and tests repeated.

3.17.1 Operating Test

Each completed circuit installation shall be tested for operation. Equipment shall be demonstrated to operate in accordance with the requirements of this Section. One day and one night test shall be conducted for the Contracting Officer.

3.17.2 Distribution Conductors, 600-Volt Class

Test shall verify that no short circuits or accidental grounds exist using an instrument which applies a voltage of approximately 500 volts providing a direct reading in resistance.

3.17.3 Counterpoise System Test and Inspection

Continuity of counterpoise system shall be visually inspected at accessible locations. Continuity of counterpoise system to the vault grounding system shall be tested in manhole closest to the vault.

3.17.4 Progress Testing for Series Lighting Circuits

A megger test shall be conducted on each section of circuit or progressive combinations of sections as they are installed. Each section or progressive combination of sections shall be tested with a megohmmeter providing a voltage of approximately 1000 volts, a direct reading in resistance. Results shall be documented. Faults indicated by these tests shall be eliminated before proceeding with the circuit installation.

3.17.5 Electrical Acceptance Tests

Acceptance tests shall be performed for series airfield lighting circuits only on complete lighting circuits. Each series lighting circuit shall receive a high voltage insulation test.

3.17.5.1 Low-Voltage Continuity Tests

Each series circuit shall be tested for electrical continuity. Faults indicated by this test shall be eliminated before proceeding with the high-voltage insulation resistance test.

3.17.5.2 High-Voltage Insulation Resistance Tests

Each series lighting circuit shall be subjected to a high-voltage insulation resistance test by measurement of the insulation leakage current with a suitable high-voltage test instrument which has a steady, filtered direct current output voltage and limited current. High-voltage tester shall include an accurate voltmeter and microammeter for reading voltage applied to the circuit and resultant insulation leakage current. Voltages shall not exceed test values specified below.

a. Test Procedure: Both leads shall be disconnected from regulator output terminals and support so that air gaps of several inches exist between bare conductors and ground. Cable sheaths shall be cleaned and dried for a distance of 300 mm (1 foot) from ends of cables and exposed insulation at ends of cables. Ends of both conductors of the circuit shall be connected together and to high-voltage terminals of test equipment, and test voltage applied as specified in the following tabulation between conductors and ground for a period of 5 minutes.

Test Voltage, dc

16C-21

[Revised for Solicitation August 1999]

Series Lighting Circuits	First Test on New Circuits	Test on Existing Circuits
High Intensity Series Lighting Circuits (5,000 volt leads, 500 and 200 watt transformers)	9000	5000
Medium Intensity Series Lighting Circuits (5,000 volt leads, 30/45 watt transformers)	6000	3000
600-Volt Circuits	1800	600

When additions are made to existing circuits, only new sections shall be tested in accordance with "First Test on New Circuits" in table above. To ensure reliable operation, complete circuit shall be tested at reduced voltages indicated above.

b. Leakage Current: Insulation leakage current shall be measured and recorded for each circuit after a 1 minute application of the test voltage. If leakage current exceeds values specified below, the circuit shall be sectionalized and retested and the defective parts shall be repaired or replaced. Leakage current limits include allowances for the normal number of connectors and splices for each circuit as follows:

- (1) Three microamperes for each 300 meters (1000 feet) of cable.
- (2) Two microamperes for each 200 watt and each 500 watt 5,000-volt series transformer.
- (3) Two microamperes for each 30/45-Watt 5,000 volt series transformer.

If measured value of insulation leakage current exceeds calculated value, the circuit shall be sectionalized and tested as specified for each section. Defective components shall be repaired or replaced until repeated tests indicate an acceptable value of leakage current for the entire circuit.

3.17.6 Constant Current Regulators

Each constant current regulator shall be examined to ensure that porcelain bushings are not cracked, no shipping damage has occurred, internal and external connections are correct,

switches and relays operate freely and are not tied or blocked, fuses, if required, are correct, and liquid level of liquid-filled regulators is correct. Relay panel covers shall be removed only for this examination; it is not necessary to open the main tank of liquid-filled regulators. The instructions on the plates attached to the regulators shall be followed. Covers shall be replaced tightly after completing examinations and tests.

3.17.7 Regulator Electrical Tests

Supply voltage and input tap shall correspond. With the loads disconnected, regulator shall be energized and the open circuit protector observed to ensure that it de-energizes the regulator within 3 seconds. After testing circuits for open circuit and ground fault and corrections, if any, and after determining that lamps are serviceable and in place, the loads shall be connected for each circuit or combination of circuits to be energized by the regulator and the voltage and current measured simultaneously for each brightness tap. Voltmeter and ammeter shall have an accuracy of plus or minus 1 percent of meter full scale. Readings shall be recorded during the day and night in order to obtain the average supply voltage. Output current on each brightness tap shall be within plus or minus 2 percent full scale of the nameplate values after making necessary correction in the supply voltage. Late model regulators have automatic supply voltage correction in lieu of input taps, and output current does not change as supply voltage varies. When output current on highest intensity setting deviates from nameplate value by more than 2 percent of meter full scale and the regulator is not overloaded, internal adjustment shall be checked as described on regulator instruction plate. Since adjustment may be rather delicate, a deviation of up to plus or minus 5 percent of meter full scale is allowed for lower intensity settings before attempting to readjust the regulator.

3.17.8 Final Operating Tests

After completion of installations and the above tests, circuits, control equipment, and lights covered by the contract shall be demonstrated to be in acceptable operating condition. Each switch in the control tower lighting panels shall be operated so that each switch position is engaged at least twice. During this process, lights and associated equipment shall be observed to determine that each switch properly controls the corresponding circuit. Telephone or radio communication shall be provided between the operator and the observer. Tests shall be repeated from the alternate control station, from the remote control points, and again from the local control switches on the regulators. Each lighting circuit shall be tested by operating the lamps at maximum brightness for not less than 30 minutes. At the beginning and at the end of this test the correct number of lights shall be observed to be burning at full brightness. One day and one night operating test shall be conducted for the Contracting Officer.

-- End of Section --